THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXVIII. No. 2161.] LONDON, OCTOBER 11, 1904. [56TH YEAR. PRICE 6d.

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OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

SAFETY GAS-MAIN STOPPER,

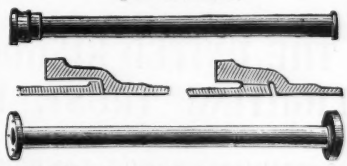
FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS.

GAS-LEAK INDICATOR.

PRICES AND PARTICULARS ON APPLICATION.

GAS AND WATER PIPES

1½ to 12 in. BORE.



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Saves its Cost many times each Year.

TESTIMONIAL

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RESULTS GUARANTEED.

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GENTLEMEN,

We have now had your Retort Scurfer at these Works for over Twelve Months, and having tried several forms of de-scurfing Retorts, we have no hesitation in saying that it is by far the best Apparatus we have tried for this purpose. **Two men have several times drawn a Setting of Seven Retorts, thoroughly cleaned the same, and charged the Retorts again within 6½ hours.** As a matter of fact, it is unnecessary for a Retort to be out of use more than 40 minutes for scurfing purposes if your apparatus is used.

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I am, yours faithfully,
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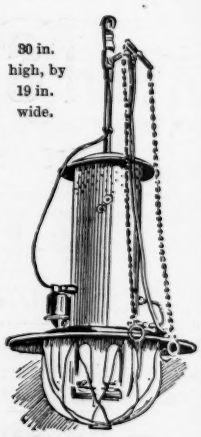

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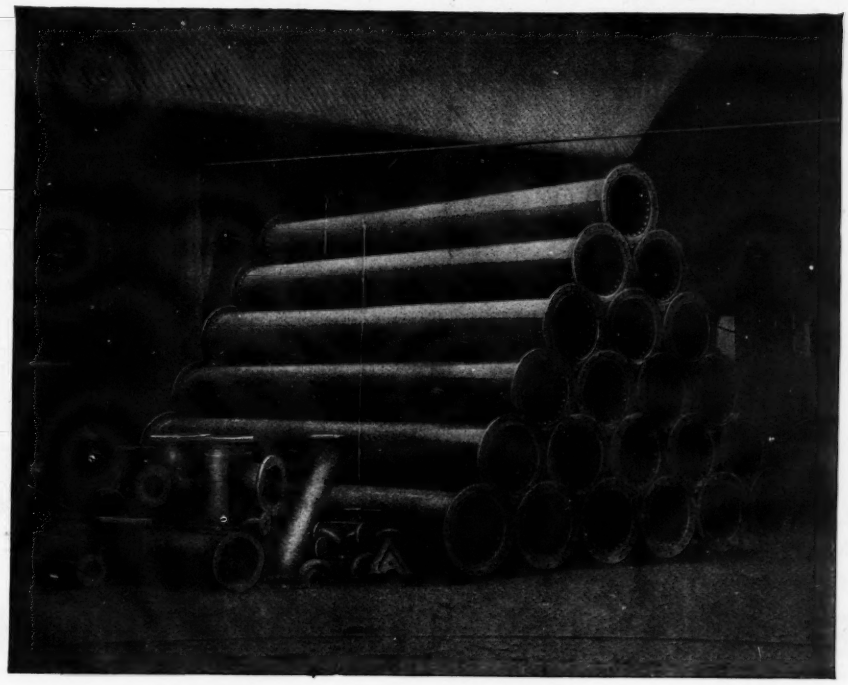

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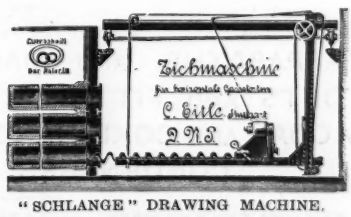

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ADVANTAGES OF THE "KOBOLD" CHARGING APPARATUS.

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2.—Almost indestructible in construction, as there are no combustible parts exposed to the heat of the Retorts.
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6.—Smallest consumption of power.
7.—Most rapid working, as the complete charging of a retort requires only two pulls of a lever.
8.—May be set at any position in regard to height by either manual or motor power.
9.—Lowest cost to purchase; paying interest and redemption in about three years.

ADVANTAGES OF THE "SCHLANGE" DRAWING MACHINE

1.—The simplest and best drawing machine in the world for horizontal retorts.
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6.—Most substantial construction, and consequently very low maintenance charges.
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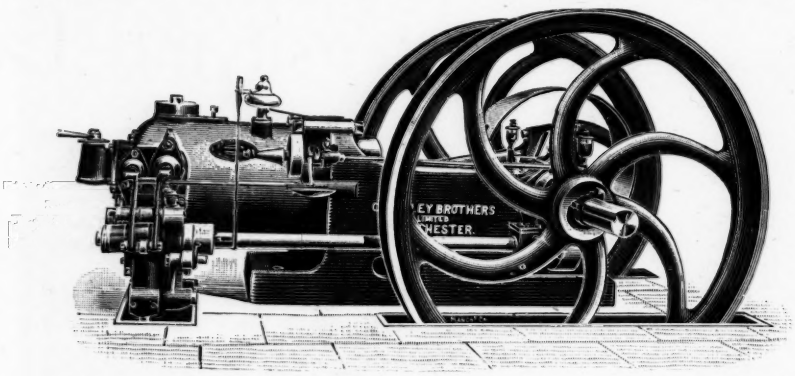
SUITABLE FOR DRIVING EXHAUSTERS, PUMPS, &c.



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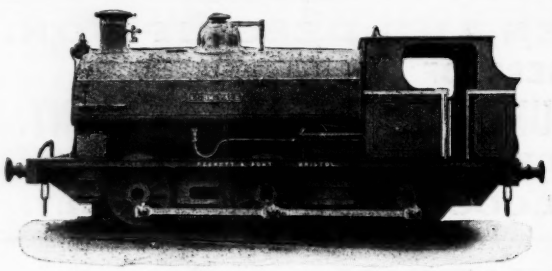

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PLANT, APPARATUS, AND MACHINERY FOR GAS AND CHEMICAL WORKS.
RETORTS AND FITTINGS, MOUTHPIECES WITH SELF-SEALING LIDS.
IMPROVED COAL AND COKE HANDLING PLANT, CONVEYORS, AND ELEVATORS.
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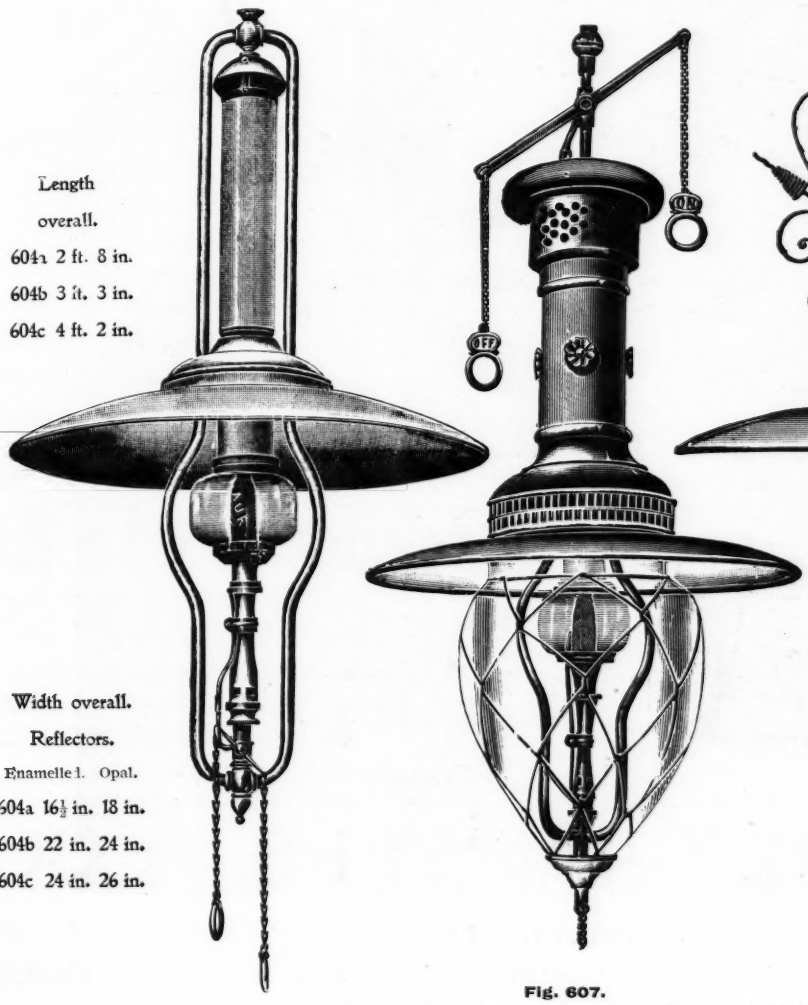
Self-Intensifying Lamps.

Length overall.
604a 2 ft. 8 in.
604b 3 ft. 3 in.
604c 4 ft. 2 in.

Width overall.
Reflectors.
Enamelled. Opal.
604a 16½ in. 18 in.
604b 22 in. 24 in.
604c 24 in. 26 in.



Length overall. Same as sizes 604.

Width overall. Same as sizes 604.

Fig. 607.

Fig. 604.

Interior Lighting. Enamelled.	
A 5 ft. per hour, 150 c.p.,	£1 13 0
B 10 ft. „ 300 c.p.,	2 8 0
C 20 ft. „ 600 c.p.,	4 4 0

Overall. Length. Width.	
607b 4 ft. 4 in. 24 in.	
607c 5 ft. 0 in. 29 in.	
Storm Proof Arc. Enamelled Reflector, Cup and Ball Joint, Lever Tap and By-pass	
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607c 20 ft. „ 600 c.p.	7 10 0

Fig. 605.

Interior Lighting (Ornamental).	
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605b 10 ft. „ 300 c.p.,	3 16
605c 20 ft. „ 600 c.p.,	5 0 0

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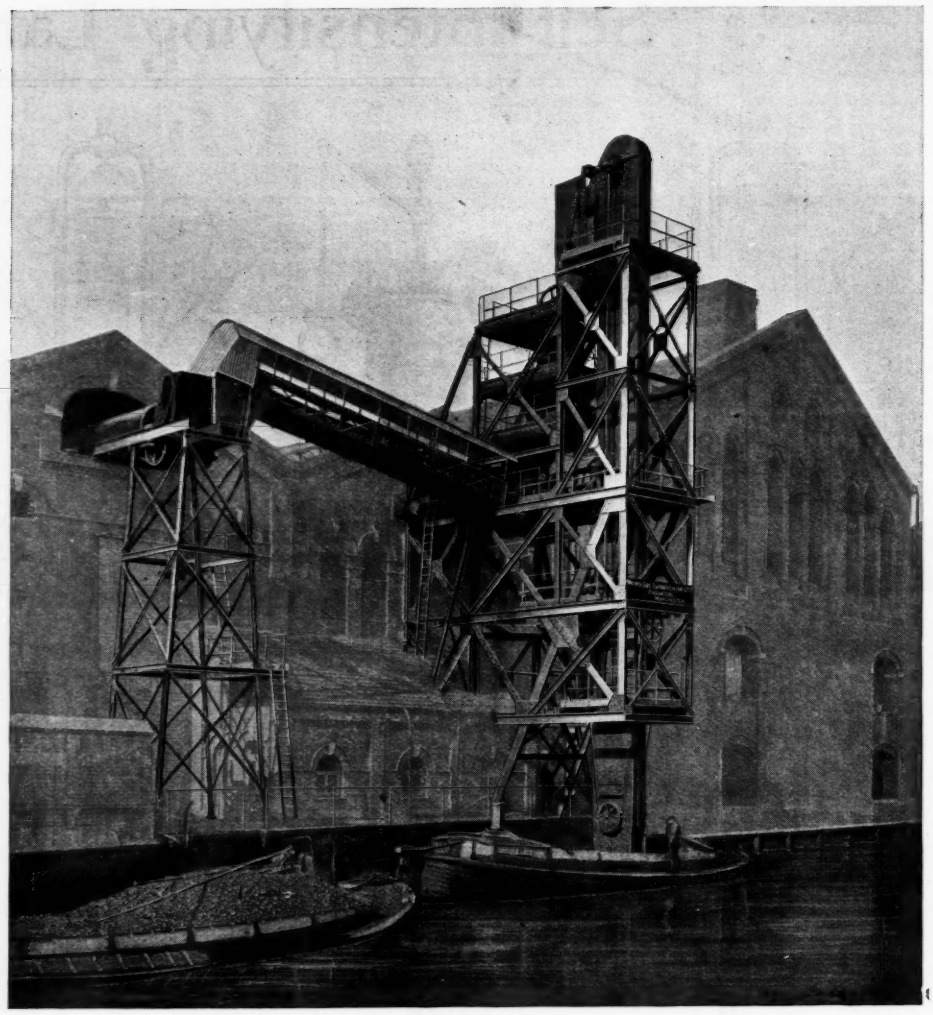

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Over 140 Installations of West's Stoking Machinery now at work.

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The Bournemouth Arch-Pipe.
Belton's Relief Apparatus for Hydraulic Mains.

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PERUSE IT. Its illustrations suggest MINES OF WEALTH to the enterprising Ironmonger, Gasfitter, Plumber, and to all who handle the goods indicated by the title of the book.

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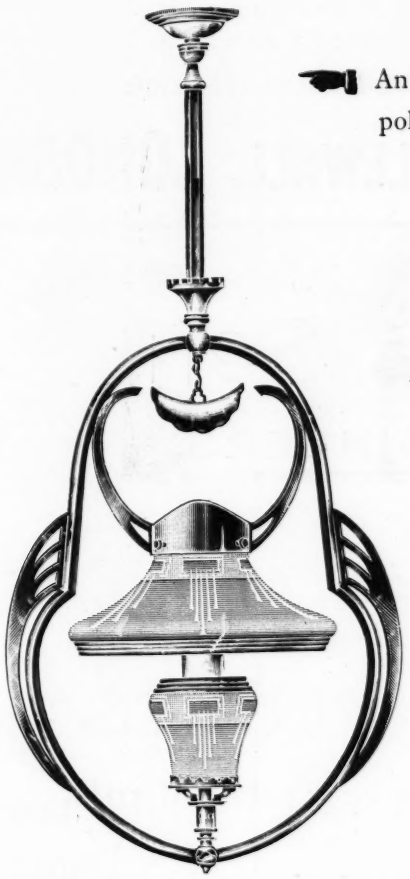

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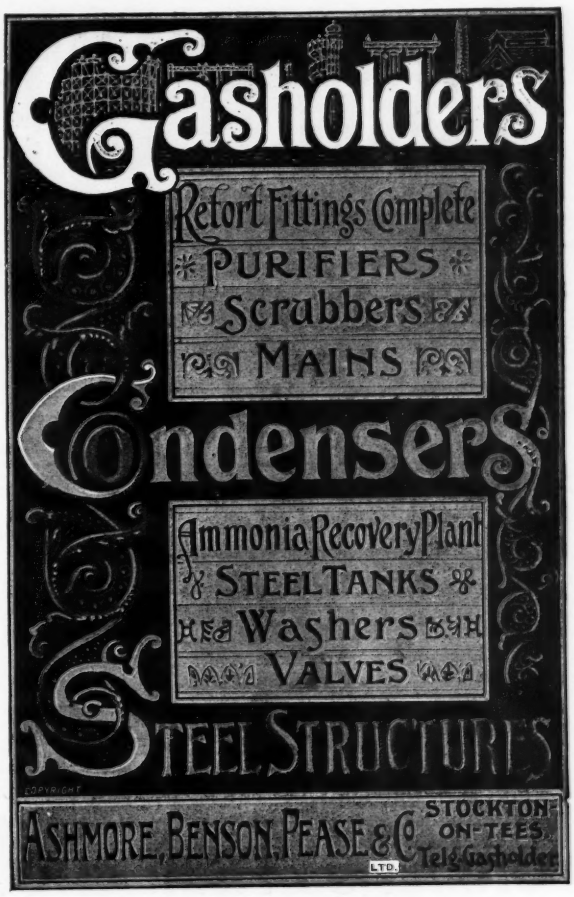
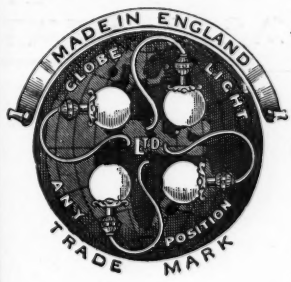


GLOBE LIGHT



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STRONG DOWNWARD ILLUMINATION

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CHESTER - -	1	PURIFIER	24 × 22 × 5	3
CHESTER 2nd ORDER -	1	,,	24 × 22 × 5	3
ROCHESTER - -	4	,,	20 × 20 × 5	6
ROCHESTER 2nd ORDER	2	,,	24 × 20 × 5	0
SOUTHEND - -	2	,,	20 × 15 × 4	6
HULL - - - - -	2	,,	20 × 20 × 5	0
BRENTFORD -	1	,,	20 × 30 × 7	0
WINCHESTER -	4	,,	15 × 15 × 6	0
CAGLIARI - -	4	,,	10 × 10 × 4	0
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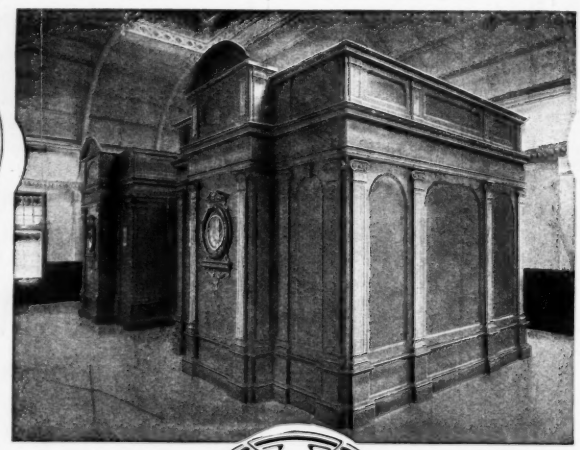

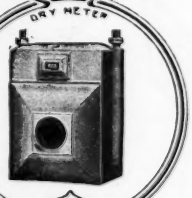

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GRANTON GAS WORKS FOR THE EDINBURGH & LEITH GAS COMMISSIONERS.

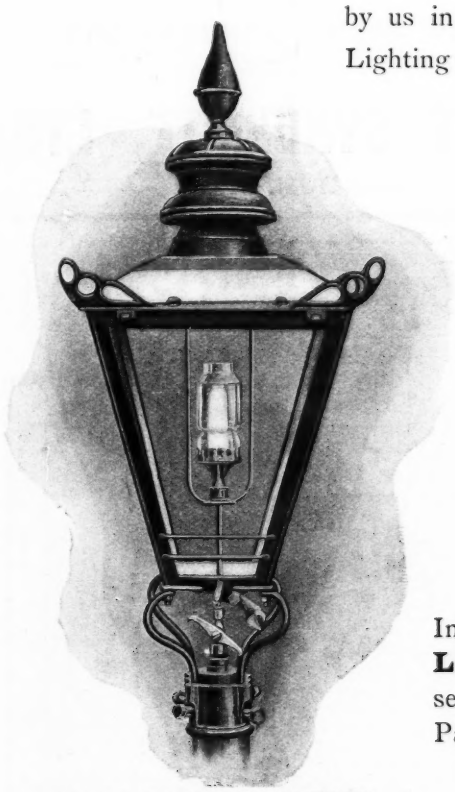
BRAY'S
"BAGBY" LANTERNS
FOR
INCANDESCENT STREET LIGHTING.

Made throughout of COPPER (Tinned).

FITTED WITH

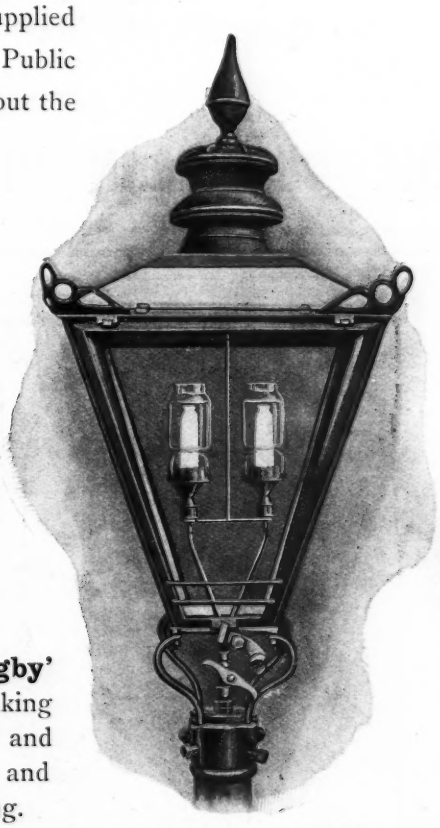
Enamel Earthenware Reflectors, and "Bray" C Burners, complete with Anti-Vibrating Frames.

These Lanterns are being supplied by us in large numbers to Public Lighting Authorities throughout the Kingdom.



No. 1 "BAGBY" LANTERN.

In addition to the **'Bagby' Lanterns,** we are making several other Styles and Patterns for Street and other Public Lighting.



No. 2 "BAGBY" LANTERN.

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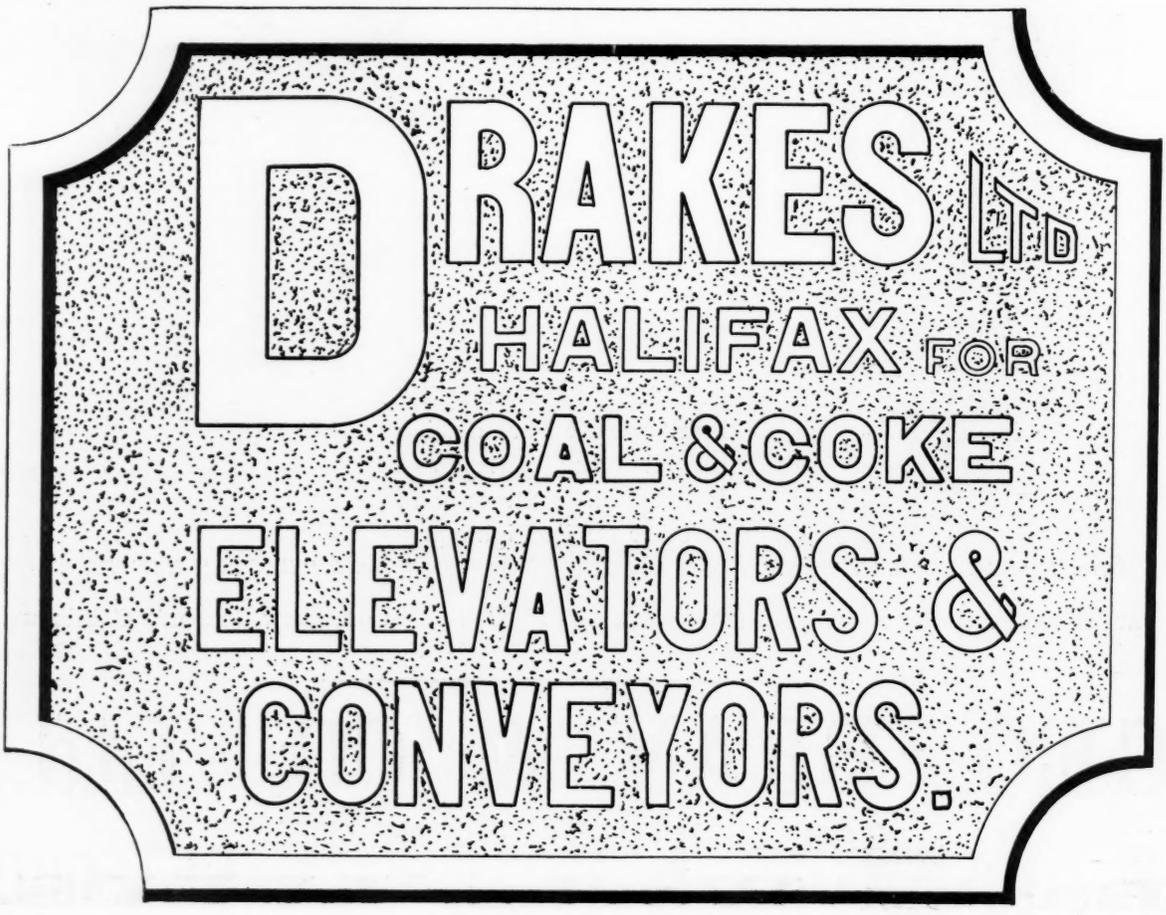

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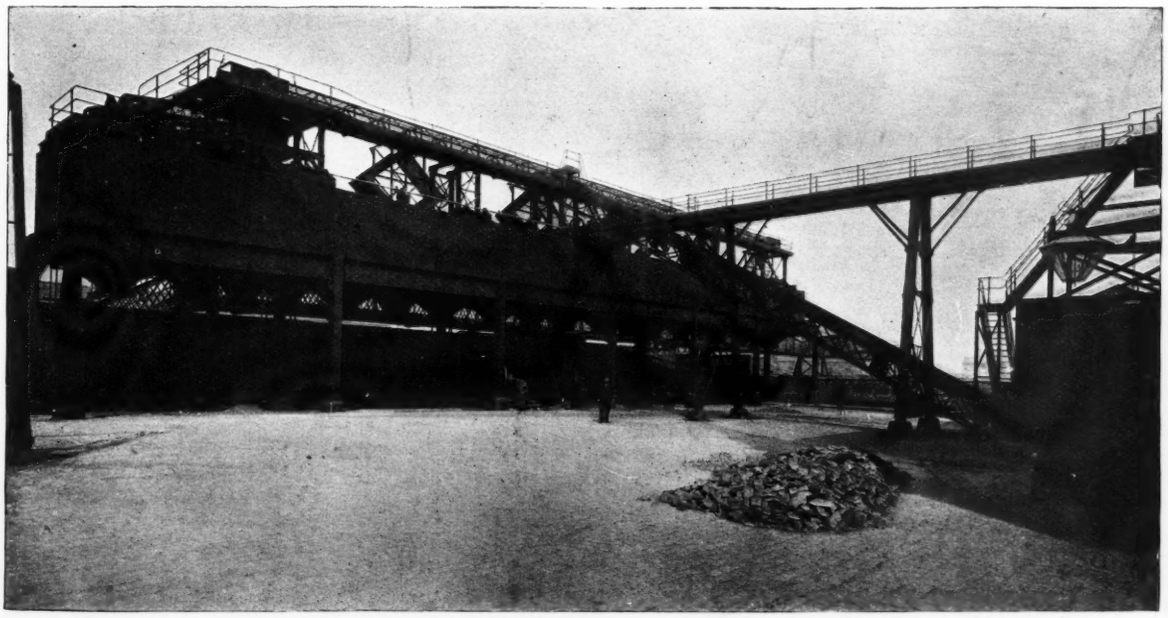

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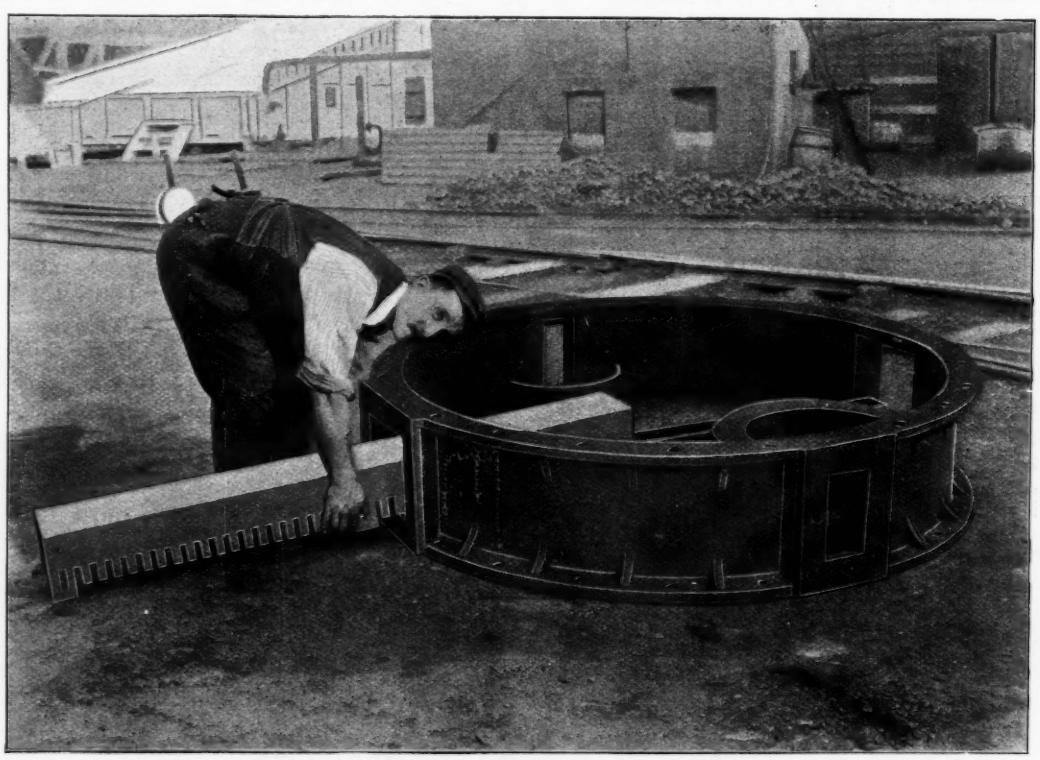

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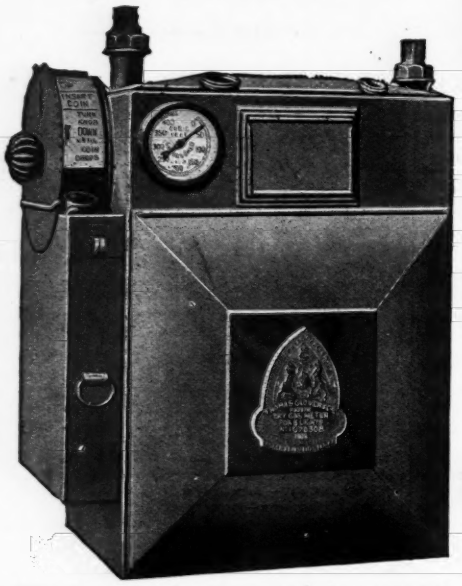

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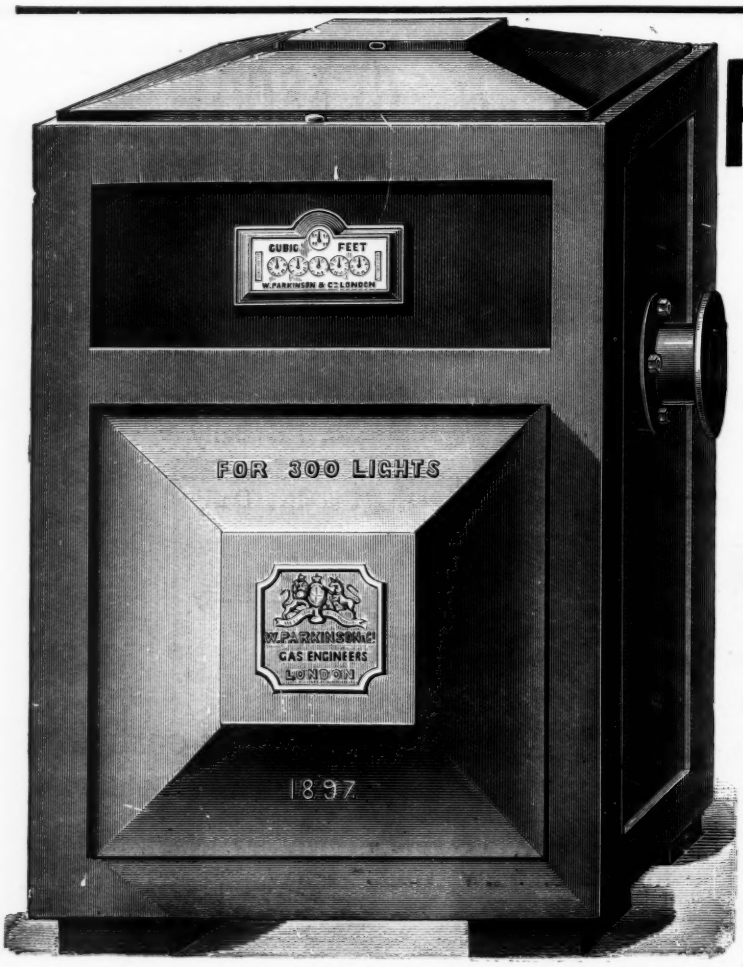

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VOL. LXXXVIII., No. 2161.—TUESDAY, OCTOBER 11, 1904.

EDITORIAL NOTES—GAS, &c.

The Nationalization of Canals.

THIS important subject was discussed at the recent meeting in Manchester of the Association of Chambers of Commerce, on resolutions of approval which were submitted by both the Manchester and Liverpool Chambers. In the course of the discussion, it was pointed out that there are 4000 miles of barge canals in this country, of which about 2700 miles are independent, and about 1200 miles controlled by the railway companies. The extent to which these canals differ in "gauge"—indicating a limited interchange of traffic, and their subservience to local requirements—is shown by there being only 230 miles capable of carrying boats of 90 tons; while 2000 miles can carry boats of 60 tons, and the remainder boats of only 18 tons. This latter seems to be an error, since the boats on our smallest canals carry from 22 to 25 tons of heavy material, such as coal. But this does not affect the argument. Seeing that on the Continent the waterways are said to be capable of accommodating boats up to 1000 tons, it was argued that this country is labouring under a great disadvantage. That, however, is very much a question of existing conditions. Given a fairly flat country, requiring but few locks—which impede the traffic and add to the cost of working—and for goods or minerals not requiring such despatch as only a railway can give, there can be no question of the great utility of water communication. Suppose, for instance, that the collieries of the Midlands were to be connected with London and the Thames by a water-way capable of carrying vessels of 1000 tons burden, they should be in a position to compete on much more equal terms than at present with seaborne coal.

The question is, How, and at what cost, could such a system of water-ways be made to link together the various scattered sources of traffic? And this is much more easily asked than answered. The larger the water-way, the greater the difficulty to be overcome; and that the promoters of this movement rely for success upon a more general use of larger water-ways, is clear from the discussion which took place. It is not, however, equally clear that the enlargement of existing water-ways forms a part of their programme, or that this is necessary to any great extent. It is a task that bristles with difficulties. Take, for example, the net-work of small canals intersecting Birmingham and the neighbourhood in almost all directions, connecting the "hardware "village" with what was more commonly known a generation ago than now as the "Black Country," and both with London southwards and the Mersey northwards. This system of canals must have contributed in no small degree to the prosperity of Birmingham, by bringing to the very doors of its manufacturers the necessary supplies of fuel and other material. It is doubtful if any useful purpose could be served by widening these canals—at all events, this would be so in the Birmingham district—seeing how well they appear to be adapted to the particular traffic of the district; and the expense of doing so would be very great, owing to the amount of valuable property that would have to be sacrificed. These canals are to some extent under the control of a Railway Company, who guarantee to the stock-holders a fixed percentage. It does not, however, appear that this control is exercised to the detriment either of the Canal Company or the manufacturers who line the banks of the canal, though it is conceivable that traffic beyond what is required to yield a sufficiency of revenue to meet all charges may be diverted to the railway. The principal object of the arrangement, however, is the prevention of competition.

The prospect of competition with the State is, consequently, not likely to be an agreeable one to the railway companies, who may be expected to offer the most strenuous opposition to any proposal such as the one under consideration; nor would it be right, unless with ample safeguards, for public funds to be used for the purpose of competition with private enterprise. Apparently, however, considerations such as these did not weigh with the Associated Chambers, for the following resolution was ultimately passed: "That, in the opinion of this Association, the time "has arrived when the British Government should take "over the whole of the canals of the country and work them "in the public interest, or, in the alternative, that the canals "should be transferred to a national public trust, with a "Government guarantee, supervision, and control." After a show of hands, in which 65 delegates voted for, and 72 against, this resolution, voting was taken by chambers, when it was found that 61 chambers were for, and 40 chambers against, the resolution. But as the rules of the Association require a two-thirds majority in a matter of this kind, the resolution in favour of the nationalization of canals was lost. A movement, however, that can command such a weight of opinion in its favour will in all probability be heard of again, and, perhaps, at no great distance of time.

The Labour of the Gas Industry and the Coming Winter.

A HARD winter! This is the gloomy prognostication for the season that is before us; and there are too many signs of its truth already visible for one to shunt it to the rear as the mere hallucination of a disordered and pessimistic mind. A hard winter! That is the blackest of the ugly things that the poor have to face. Poverty, a great percentage of them are always sailing over in the lightest of skiffs which a slackness of work upsets, and makes them feel that which is below. But this—if only temporary, and not accompanied by other influences—is bearable. When, however, work ceases, and the means of procuring the necessities of life and the wherewithal to obtain comfort in the home, in the cold dark days of winter—then, only those in the position can appreciate, in their bitter fulness, the meaning of the ominous words "A hard winter." It is easy to talk of improvidence, of want of thrift, and of a dozen other evils that are attributed to the working man; but those virtuous ones who talk the loudest have frequently "not been there" themselves. It is conventional to talk so; it is the most facile way of disposing of an unpalatable subject. Working men are not angels; they are not without their faults. Nor are those who are set above them, notwithstanding all their superior education, more comfortable environments, and all the higher advantages which they enjoy. But working men, taken as a body, are not so black as they are often painted. We say this, in order that no one in the gas industry who is in the enjoyment of his sufficiency, and even plenty, during the coming months may, if the worst befalls, harden himself against the claims to consideration of those who are in a less fortunate position.

Viewed from the position of this labour question, the gas industry has much to be thankful for. It is a large employer of labour; and a blessing it is that the height of the employment comes just when labour is most in need of it. In the coming winter—however depressed the general trade of the country, however hard the winter—the gas industry will no doubt be employing more labour than ever before. Depressed trade and the hardness of the winter will, of course, on the one hand, affect the sales of gas to a degree; and to the extent that it does so, the industry will suffer in common with the country generally. But it will not suffer in the same proportion as many other industries. The prosperity is such now, and the requirements for gas so many, that there will be no falling off in the quantity of labour that will be demanded. The portents are that not only will the winter be a hard one for labour, but that the atmospherical conditions will be particularly severe. If this be true—though, unfortunately, it will be all the worse for the distressed—then more gas will be burned by those in comfortable circumstances; and so the labour of the gas industry—those immediately employed in and about the manufacture

and distribution of gas—may, so far as they and their families are alone concerned, look with equanimity upon the coming period of widespread suffering. This shows that service in the gas industry is not by any means to be despised by the workers of the country. It is perhaps the circumstance that in the gas industry employment in the winter is the greatest, that has done more to stop the growth of the beneficent system of profit-sharing or co-partnery than anything else. If the pinch of the poverty of its labour had been keenly felt when the inexorable grip of winter is upon us, then might there not have been a greater emulation of the tenets, acts, and methods of the industry's labour protagonist?

The position is, as is always the case in the winter, not an unsatisfactory one for, as we have put it, those who are immediately employed in the gas industry. But there are those whose employment is closely identified with the gas industry; and what of them? They will be largely under the harrow of poverty and distress in the coming winter. Only just recently we remarked upon the slackness in the iron and steel and engineering trades; and the intimacy of these trades with the gas industry is of the closest. The business of the year for gas engineering contractors has not been of a buoyant order; and the business of the hardest months of the year must be, from unavoidable obstructing circumstances, even more flat. In this the gas industry are helpless, and nothing much can be immediately offered by gas undertakings with the view of ameliorating the conditions. During the busiest season of gas making and supplying, extension and other work cannot go forward; and, besides, in large measure, the needs of the future can only be rated by the experiences of the winter. Already it is known that there are in Manchester some 10,000 heads of families unemployed; and many of these no doubt are in the ordinary way employed by industries with which the gas industry does business. Leeds again has at the present moment over 3000 names on the register at the unemployed bureau. If these are illustrations of the state of things now, what will be the condition as we get into winter and approach the depths of its severity. Of course, there are—it must be so—among those unemployed, a number of those whose condition in that respect is chronic, and many who come into the category of unemployables. But the greater number are genuine and honest workmen; and just imagine what the 10,000 in Manchester alone represent! We speak of a number of men being of the unemployed. The number perhaps does not strike us as being wonderfully great. Multiply the unemployed by five or six, and not till then do we get even an approximate notion of the number who, through that want of employment by the breadwinners, are suffering privation, and in all probability acutely so. The local authorities are bestirring themselves to see what can be done to assist in alleviating the miseries of the poor in the winter through relief work; but it is a difficulty of no mean kind to attempt to absorb so much disengaged labour. As has been publicly pointed out, relief work of this character is always wasteful and expensive for the ratepayers; but better that, from all points of view, than direct monetary relief to able-bodied men without return in the way of labour. And there are not many working men who do not prefer the term "worker" to "pauper." In this connection, it is a satisfaction to see that, on the invitation of the President of the Local Government Board, there is to be a conference of representatives of the Metropolitan Guardians with him on the subject of the impending want of employment and a possible large increase in destitution. At that conference, any practical proposals which may be offered will be discussed, with the view to action.

But there is the position; and each reader of the "JOURNAL" must view it not only from the standpoint of the gas industry, but from that of a responsible unit of the community. It is something to be thankful for to be identified with a prosperous, and in many respects favoured, industry, and one whose prosperity does not leave it, though it may be affected, even when such blighting influences are at work as the country is evidently now about to face. Those in the service of the industry—from the highest to the lowest—are not exposed to many of the perils that beset service and labour in most other industries; and this, we hope, will be remembered by all readers when (if unfortunately necessity compels) the appeal comes to them to share in any well-organized effort to alleviate the sufferings and wretchedness that appear likely to abound, through the ill-fortune of labour, in every industrial centre, and more or less in every town.

The Scottish "Juniors."

THE Scottish Junior Gas Association, as represented by its two divisions—the Eastern and Western Districts—have already asserted, in vigorous fashion, their right to recognition, and have established themselves as centres of culture. Although each section has held only one meeting, the technical literature of the gas industry has, we say it without any intent to flatter, been enriched by the inaugural addresses delivered by Presidents of their own selection, and of themselves. It may be claimed—if any further justification were needed for the advocacy of a fuller acknowledgment of the junior members of the profession, and for the enforcement of their claims on their elders for improving opportunity—that if persistent action had not been taken, the pages of the technical press would not have had, from the pens of Mr. A. Masterton, the President of the Eastern District of the Scottish Association, and of Mr. James Lowe, the President of the Western District, two addresses abounding with intelligent appreciation of the requirements of the engineer's professional life, and with other matters of supreme moment to the gas industry. It may further be claimed that the outlook for the senior Institution and the Associations is made the brighter by the establishment of such new organizations as this; for from the one to the other will pass men already practised in debate and in the preparation of the necessary subject-matter. And last, but foremost in the order of importance, the men who will rise from these Junior Associations will have had greater opportunities for qualifying themselves for their life's work than many of their predecessors who hold place in the leading ranks of the industry, and who were perforce condemned to a sequestered form of training. These are the ends for which we have contended; and the hope that these ends will be attained becomes stronger with the brilliant experiences that the juniors themselves are accumulating.

Just a line or two of explanation as to the term "juniors" as applied to the Scottish Association. It is an expansive one, and it is not exclusive in its operation. It does not in this Association necessarily denote the junior in years; the term includes all who, on the staff of a gas undertaking, are junior in relation to the chief, and all who, occupying positions subordinate to the chief, are anxious to improve their knowledge of the manufacture, composition, distribution, and utilization of the commodity through and by which they earn their subsistence. Those are the indefinite bounds of the new Association within which are set very definite aims; and those are fields that the senior organizations have never yet attempted to cultivate. As Mr. Masterton says, and as many wise men have said before him, "knowledge is power;" and it is a power that is not only a possession of the individual, but of those whom that individual serves. If this is recognized to the full as it should be, then these junior organizations will receive nothing but whole-hearted support from those on whose staffs the men so associated may happen to be. Furthermore, the juniors must see that those who grasp the opportunities thus provided will be the best equipped men for taking part in the race for position in the gas industry. Influence may give a man a position; but influence will not keep him there. Deeds, work, action, are required when responsibility is conferred; and results are the stubborn measure nowadays of a man's capacity. And a man's capacity may be largely moulded and developed by associating himself with, and participating in, the work of an active junior organization.

Both Mr. Masterton and Mr. Lowe—more particularly the former—dwelt in their addresses upon the question of the education of the gas engineer and manager; and coming from men who have obtained high position as assistants in the two leading gas undertakings of the two great cities of Scotland, and who are comparatively fresh from the mill, their views will be read with the interest and attention which they richly deserve. Their points are many—too many to bring within the compass of an editorial comment. There is, however, one specially noticeable matter which Mr. Masterton brought into prominence in endorsing the views of Mr. W. Cranfield, the President of the Yorkshire Junior Association, as to the establishment of chemical laboratories for gas students in convenient centres. Chemistry students of the Heriot-Watt College who have studied two winter sessions will be permitted by the Edinburgh and Leith Gas Commissioners to attend at the gas-works for four months in the following summer, and those who have taken three

winter sessions at the College will be allowed twelve months at the works, where facilities will be provided for analyzing and testing all the available kinds of gases and material. It is no mere idle compliment when we say that, through their action, the Gas Commissioners have pioneered an imitable example which should minister greatly to the well-being of the gas industry.

The address delivered by Mr. Masterton was published in last week's "JOURNAL;" that by Mr. Lowe is in the current issue. The greater part of the latter gentleman's address was taken up with a studied disquisition replying in the affirmative to the question: Is the gas industry possessed of the elements of stability and permanence, in view of the increasing competition to which it is subjected? The most crucial test which one can give to any serviceable commodity in comparison with competitors is its economy in relation to performance; and, whether examined as a means of obtaining power, light, or heat, gas (as an economical agent) came out in the address, as it does in practice, "on top." But Mr. Lowe did not shirk giving credit where credit is due to any of the competitors. The coalfields are the life-blood of the country; and the expenditure of that life-blood is going on with reckless extravagance. Retrenchment and economy are needed; and gas, Mr. Lowe proves, offers the best way. We have to thank both Mr. Masterton and Mr. Lowe for two thoughtful and well-written addresses, in which many besides the "juniors" will find much profitable matter.

Water Gas and Producer Gas in Industrial Establishments.

IT shows renewed official cognizance of the poisonous quality of producer and water gases when a memorandum full of significant statement and caution is issued by the Home Office, with the signature attached of Dr. Arthur Whitelegge, the Chief Inspector of Factories. The principal parts of the memorandum are published to-day in our "Miscellaneous "News" columns. It is only just a fortnight since that, in connection with the last Brighton poisoning case, it was suggested to the suppliers of carburetted water gas that they should take heed of the limitation that was imposed on the distribution of producer gas in respect of its carbon monoxide content. Parliament has named 14 per cent. as the outside allowable proportion of this constituent in producer gas, and yet has ordained that this gas, even with a distinctive and readily perceptible odour imparted to it, must not be distributed in dwelling-houses. It so happens that, according to the admission of Mr. J. Cash, 14 per cent. represents the proportion of carbon monoxide in the mixed gas the Brighton Company were supplying at the time of the fatal occurrence referred to; and it is singular that the warning of a fortnight ago should so soon have been emphasized by this memorandum from the Home Office.

The large expansion in the use of water gas and producer gas for industrial purposes has been noticed by the authorities; and the increase, with the extended use of these gases, in the number of cases of poisoning—fatal and otherwise—in factories, has also not passed unobserved. It is expressly with the one object of calling attention to the fact that these matters are again awakening concern in the official mind that Dr. Whitelegge's memorandum is mentioned, because really there is not, beyond the statements in the opening parts, much in it that is new. But the portions of the document dealing with the symptoms of carbon monoxide poisoning, the appropriate remedies, and the preventive measures will be useful to all who are engaged in the manufacture, distribution, and use of gases containing the higher percentages of carbon monoxide—that is to say, higher than the percentages that obtain where coal gas holds alone the field of application of gas to lighting, heating, and power purposes. By the Acts dealing with the distribution of producer gas, the duty devolves upon the inspectors of factories and of mines to enforce the provisions of the section as to the gas containing not more than 14 per cent. of carbon monoxide, and as to a distinctive smell being imparted to it—any contravention in these respects imposing on the offending company liability to a penalty of £50. Of course, this does not refer to the distribution of a mixture of carburetted water gas and coal gas; but the knowledge that the inspectors of factories are interesting themselves in carbon monoxide percentages should deter those suppliers of coal and water gas in industrial centres from exceeding the statutory limit of the producer gas people. To keep the proportion of carbon monoxide below that of the competing producer gas is clearly one of the surest ways of putting a bar to the imposition of like ties and penalties.

In dealing with the Brighton matter the other week, it was suggested that the Medical Officer might do worse than see whether the gas-fittings of such places as hotels, boarding houses, and lodging-houses could not be periodically inspected; and possibly it may have occurred to some of our readers that this was not seriously meant. If so, they were very much mistaken. It will be observed that, in the memorandum now under notice, Dr. Whitelegge, among his preventive measures, places inspection in a prominent position in the list; and these words cannot be taken as being meaningless and without importance: "In towns where "the public gas supply is largely charged with water gas, "attention to gas-fittings in factories and workshops be-"comes a matter of increased moment." If suppliers of a mixture of coal gas and carburetted water gas do not practise restraint and keep their mixture well within the carbon monoxide rule as applied to producer gas, they will, it is certain, bring upon themselves an enforced limitation and penalty, or perhaps (as an alternative) compulsory inspection, and responsibility for the soundness, of consumers' fittings. But in this matter, where (say) 14 per cent. of carbon monoxide is concerned, rather the limitation and the penalty attaching to infraction than the grave responsibilities that would accompany inspection.

Prepayment Meter Supply in South London.

In an article, on "Small Beginnings," which appears in the "Co-partnership Journal" of the South Metropolitan Gas Company this month, Mr. Frank Bush refers to the wonderful growth from a "small beginning" of the slot-meter system in the South London district. The system commenced at Michaelmas, 1892, and the Company had two collectors—the rental for that half year being £178 2s. 2d.! Its growth has been extraordinary, as the following figures show:—

Year.	Number of Consumers.	Rental in Pennies.
1893	9,794	£6,327 15 9
1894	25,516	29,657 5 5
1895	42,949	73,386 2 8
1896	56,902	119,339 3 1
1897	66,560	152,226 2 0
1898	80,115	183,604 15 3
1899	95,068	199,294 17 2
1900	109,586	271,454 0 4
1901	123,129	319,589 11 9
1902	139,113	348,590 2 9
1903	155,829	391,204 9 1

There are now 116 collectors engaged in collecting the pennies from these meters; all being chosen from the Company's own workmen—the rule being only to appoint such. These positions are much sought after; and at the present time there are not, Mr. Bush says, less than fifty applicants on the list waiting for appointment. One of the conditions is that each must hold £25 of stock; and, as time goes on, this amount will have to be increased. A further condition is length of service; this must not be less than from seven to ten years. It need hardly be said that Mr. Bush takes great interest in these men, because, at the desire of the Directors, he has, it is believed, appointed every one of them.

Nottingham and its Gas Supply.

Judging from the report of the proceedings at the last meeting of the Nottingham City Council, there is some dissatisfaction with the price and quality of the gas supply; but possibly this (at any rate as regards the latter point) will diminish when the members and the consumers generally have had fuller opportunity of studying the report of the Engineer (Mr. J. H. Brown) which was referred to in last week's "JOURNAL," and is further noticed elsewhere in this issue. Mr. Brown has plainly given his opinion as to the cause of the complaints; and it is only fair that calm consideration should be accorded to what he now says on the subject before further grumbling is indulged in. To find fault with the price, and then with the steps which are being taken to reduce the cost, is illogical. After all, in advocating the reduction of the illuminating power of the gas, Mr. Brown is, as he says, merely

following a plan which has been successfully adopted in other places; and what has proved so good for cities and towns in all parts of the country, can hardly be bad for Nottingham. In connection with this matter, we publish to-day some interesting correspondence between Sir George Livesey and Mr. Brown which deals with the advisability or otherwise of the adoption of water-gas plant at Nottingham. Mr. Brown points out that one of the greatest difficulties with which he is confronted with regard to the reduction of the illuminating power and the carbonization of local coals, is the disposal of his coke; and this has led him to carefully consider the question of the use of blue water gas, in conjunction with gas made from certain cannel, the coke from which is practically useless in the ordinary way of working, but can be employed very satisfactorily in an experimental water-gas plant he has put down. Sir George, in his reply, says he has always contemplated the necessity of introducing water gas for such reasons of policy as may arise in connection with coal and coke markets; and it seems to him the course proposed by Mr. Brown is the best—that is, to use the cannel referred to for gas making, and its coke for the water gas.

Political Gas Administration.

At Leeds (where, as in too many other places, the Municipal business would seem to be conducted mainly on Party lines), the gas undertaking was last week made the means of furnishing a retiring Conservative member with a very attractive "plank" for his platform. The gentleman referred to moved in the Council that the Gas Committee should be instructed to make arrangements to sell gas to prepayment consumers at the same price as to ordinary ones; and the seriousness with which the proposal was regarded may be judged from the fact that it was received "with a roar of laughter," and a question as to why he had been three years in bringing it forward. Whether or not the laughter was only indulged in by his political opponents, we do not know; but, at all events, there was—considering the many weighty arguments to be adduced on the other side—a strange unanimity on the part of the Council in recording their votes. What effect the resolution will have on the re-election of its mover, remains to be seen, as also does its result on the price charged to the prepayment consumers in the city.

Municipal Money Troubles.

The miserable straits to which Corporations are reduced by the impossibility of floating large issues of stock at the cheap rates of a few years ago received another illustration last week. The Bristol Corporation wanted £750,000, and the Finance Committee were authorized to take the necessary measures for the issue of 3 per cent. stock to this amount. The Committee found that it could not be done. The mere suggestion that a fresh issue was contemplated proved sufficient to cause a fall of two points in the current quotation for the stock. It is true, no doubt, that the credit of Bristol stands as high as that of any municipality with which it can be reasonably compared; but there is no market now for Corporation stock at 3 per cent. Being convinced of this fact, the Finance Committee decided, in the first place, to restrict their borrowing to £600,000; and, in the second, to raise this amount on debentures at 4 per cent., payable in six years. In one respect the Corporation are more fortunate than another great Municipality in the West. Plymouth the other day had to pay a bonus of £5000 in order to raise £250,000 on 4 per cent. bonds; while Bristol has managed its issue at par. Still the difference of 1 per cent. in the rate of interest, which represents in this case £6000 per annum, will be felt by the ratepayers, and will adversely affect even those enterprises which Progressive municipalities fondly cherish because they are supposed to be profitable. Dear money is having the natural effect of checking capital expenditure, though it adds in another way to the burden borne by the ratepayers.

London Follows the Provinces.

Islington has decided to follow the example which has of late been set by many provincial cities and towns, in the matter of borrowing money on short mortgages—that is, mortages on the security of the rates, terminable by three or six months' notice on either side. The proposal appears to be a new one so far as London is concerned; it having hitherto been the custom for the local Councils to borrow from the County Council, the Public Works Loan Commissioners, or the Insurance Companies. This system, of course, binds the borrowing Council to pay interest at the rate of the day for the full term of the loan; and this Islington (seeing that the present rate is high) is disinclined to do. The amount just now needed is trifling (especially considering the purpose for which it is required); being merely £33,026, for purposes of electric supply extension. The greater part, however, is wanted for a period of 42 years; and the system of borrowing to be adopted will enable the Council to profit should money at any time within this period become cheaper. The Finance Committee remark that there are many persons possessed of small savings who would, they believe, welcome such an investment; the security being often of more importance than a high rate of interest. No doubt there are many people possessing small savings, but why they should prefer to lend the Council their money, and have to trot up to the Islington Town Hall (with the certificate) each time they desire to draw the interest, rather than to take advantage of the facilities which the Post Office Savings Bank offers to depositors for the purchase of Government stock, is hard to comprehend. The idea of the Council is to receive sums of £5 and upwards at 3 or 3½ per cent., as may be determined, repayable at three months' notice; and the interest will be payable quarterly, half yearly, or yearly, at the option of the depositor. It is added that the yearly system is favoured by the Council, as we should imagine it will also be by the depositor—if he lives very far from the Town Hall.

The Rickmansworth Gas-Works Purchase Question.

The Chairman of the Rickmansworth Urban District Council (Mr. C. Barton Smith) and the member of that body who proposed that the Gas Company should be approached on the subject of the suggested withdrawal of the Council from the contemplated acquisition of the gas undertaking, as reported in the "Journal" for the 20th ult. (p. 819), had an interview with the Directors, and fully discussed the matter with them. After duly considering the proposal, the Directors informed the Council that they would recommend the shareholders to contribute a sum of £800 towards the cost of obtaining the Act of Parliament, provided the Council would undertake not to promote or support any scheme for electric lighting or the supply of power gas in the district for a period of seven years. This condition the Council could not accept, and they accordingly decided that the only course open to them was to proceed with the purchase. The Clerk has accordingly been instructed to inform the Directors of the decision. At the meeting of the District Council on Thursday, a letter was produced from Mr. G. J. M. Atkins, formally acknowledging, on behalf of the Company, the receipt of the resolution of the Council to proceed with the purchase.

Flame Temperature in Internal Combustion Engines.

The erudite paper on this subject which Mr. Dugald Clerk read at the last meeting of the British Association was generally noticed in the "Journal" for Aug. 30. In the current issue of the "Engineering Review," there are published some considerable extracts from the paper, together with several of the elucidating diagrams. In an appreciative editorial reference, a reminder is also given of the highly interesting "James Forrest" lecture which was delivered by Mr. Clerk in April last at the Institution of Civil Engineers. A *résumé* of the lecture was also published in these columns at the time it was delivered. As our monthly contemporary says, the efficiency of internal combustion motors has been greatly increased during the past twenty years. It may, however, now be said that gas-engine design is entering upon a new phase; for, although the general thermodynamics of the internal combustion motor are generally understood, precise data are still lacking as to the physical and chemical properties of gas at high temperatures, and further inquiry has still to be made into the phenomena of combustion. The heat efficiencies of internal combustion motors have been increased from 15 to 30 per cent. since 1882; and it is quite certain that they can be augmented when more knowledge has been acquired. One of the first points, further remarks the "Engineering Review," that demand attention is that of the specific heat of gases entering into the chemical action of combustion at temperatures ranging from 500° C. to 2000° C. No really reliable determinations have hitherto been made at such temperatures; but welcome light on

the subject may be expected when the experiments now being conducted by Professor Harold Dixon are completed. Mr. Dugald Clerk's British Association paper deals, it is observed, with the general question of flame temperature, and particularly with the results of the experiments that were made by him with the object of securing lower and more constant temperatures in the cylinders of internal combustion motors, by diluting each charge of explosive mixture with compressed air or compressed gases from the exhaust. Mr. Clerk describes two kinds of engine in which his latest idea has been incorporated, and shows that, in one example, where compressed air is introduced, the temperature after explosion was reduced from 1700° C. to 1200° C., with an accompanying increase of thermal efficiency of 6·7 per cent.; and in the other, where exhaust gases were employed, the temperature after explosion did not exceed 1200° C., while the heat efficiency was increased by fully 20 per cent. These, all will readily agree with the Editor of our monthly contemporary, are valuable results, and demonstrate the possibility of obviating to a large extent the difficulties and disadvantages attending the use of the high temperatures hitherto prevailing in gas-engines.

Company v. Municipal Management.

In our "Miscellaneous" columns to-day will be found another reply to the letter penned recently by Mr. P. S. Bridgeford, the Secretary of the Industrial Freedom League, on the subject of the proposed purchase of the Bishop's Stortford Gas-Works. We gladly give publicity to Mr. Audsley's communication, which is by way of showing that Mr. Bridgeford's conclusions in regard to Ossett were mistaken. Of course, it is not to be denied—at any rate, the "JOURNAL" has no wish to deny—that there are municipal gas-works which are quite as well managed as are those in the hands of companies. Those who are connected with the Ossett gas undertaking are highly delighted with the results of the transfer; and no one can be more pleased than ourselves that this should be so. Our sole care is the welfare of the gas industry, with which, of course, the interests of the gas consumers are inextricably bound up. Some aspects of municipal ownership (arising out of the Bishop's Stortford agitation) were dealt with at length in a leading article in the "JOURNAL" for the 13th ult.; and now we would merely take occasion to point out that neither Mr. Audsley nor Mr. Keyte (whose letter was published last week) deals with all the arguments adduced by Mr. Bridgeford.

Gas Flow and High-Pressure Distribution.

Within the past few months the subject of the flow of gas in pipes, in connection with high-pressure distribution, has been before our readers on various occasions. It may be said to have been introduced by the masterly paper read by Professor Unwin, at the suggestion of the then President of the Institution of Gas Engineers (Mr. H. E. Jones), at the annual meeting of that body in June; and its literature has since been added to by contributions from the other side of the Atlantic. First came the interesting article by Mr. W. A. Baehr, the Chief Engineer of the Laclede Gas Company of St. Louis, describing the high and low pressure distribution methods in use in that city, which appeared in the "JOURNAL" for the 19th of July. This was followed by the publication of the experience of Mr. E. C. Jones, the Chief Engineer of the Gas Department of the Californian Gas and Electric Corporation, as narrated to the members of the Pacific Coast Gas Association at their annual meeting, and given in our columns on the 27th of last month. Now we have the paper read by Mr. L. P. Lowe before the same body, dealing with the original question of the flow of gas in pipes, which will be found in another part of the "JOURNAL." Here is a collection of papers which at the present juncture, with the supply of power gas within measurable distance, and a general tendency to increased pressure to meet day demands, merit most attentive perusal. The features of all but the last have already been noticed. With regard to Mr. Lowe's contribution, it embodies the results of his investigations—involving a not inconsiderable amount of travelling—into a question which one would have thought Dr. Pole had definitely settled by his well-known formula. In Mr. Lowe's eyes that formula contains a defect, as it does not take into consideration the increased volume of free gases due to compression. The author was able to produce one which does. His principal object, however, in writing his paper was to assure his colleagues that they need not be afraid of injuring their gas by compressing it, and to emphasize the importance of having good long lines of pipes and fittings, if they wished to derive all the advantages possible from high-pressure distribution. It stands to reason that the greater the number of angles and bends, the more the flow of a fluid will be impeded; and in this connection the paper read by Mr. J. C. Trautwine before the American Water-Works Association, on "Resistance Due to Bends in Pipes," given in the "JOURNAL" for Aug. 2, may be referred to as furnishing additional information on one of the current topics in the gas industry.

Gas Lighting by Flat-Flame Burners.

An article on this subject, written in popular vein, appears in the current issue of "Technics." The author is Mr. Thomas Holgate; and readers, without explanation, may wonder why, in this year of incandescent grace, the author has troubled to deal with flat-flame burners. The reason he advances is that, though every year the supersession of flat-flames by the incandescent mantle is becoming more complete, yet a sufficient number of flat-flame burners are sure to remain in use to make it desirable that the principle of their action should be more widely understood than at present. It is always desirable that the public should have knowledge of these matters; but we do not believe that, at this time of day, the purposes or situations for or in which flat-flame burners are employed make it desirable that "the principle of their action should be more widely understood." If Mr. Holgate will place the "desirability" on an academic plane, then we agree. Our point will be better understood by quoting a sentence from Mr. Holgate. "The facility with which the flat-flame can be reduced to a mere tip, and the low first cost and simplicity of the burner, cause it to be used where a high illumination is not urgent, or where the light is only required at intervals." These are the only purposes for which, we hope, the flat-flame burner will in time be used; and for such uses the consumers are not likely to see that there is much desirability for knowing a great deal about the principle of their action. However, Mr. Holgate insists on the point; for he says, seeing that the economy and efficiency of the burner "are largely affected by a few simple yet important conditions, and that the cost of the best burner is small in comparison with that of the gas consumed, it is obvious that the general user must be financially, as well as academically, interested in the subject." We are sadly afraid that the academic interest in flat-flame burners of those who now use them must be of a passive rather than an active order. The intelligent prefer to use the incandescent burner—the use of the flat-flame burner is left to those of another class, to cellars, to back premises, and (it is regretted) to the very poor. Among such users, the "desirability that the principle of the action" of these burners should be understood will not be appreciated.

Unionism in the Chemical and Gas Industries.

An analysis of the groups of trades represented at the Trades Union Congress held in Leeds at the beginning of last month has been made; and under the head of chemical, gas, and general labourers there are some figures which suggest that our old friends the Gas Workers and General Labourers' Union and similar organizations which can be brought within this group, are not doing quite so well as formerly in regard to membership, and that in consequence their power is on the decline. There were at the 1903 congress ten organizations in the group; and the membership which 33 delegates then represented totalled to 78,710. This year there were the same number of organizations in the group, and one more delegate; but the membership represented had diminished by 10,000—the total being 68,736. This is a big fall; and as probably the Gas Workers and General Labourers' Union is the largest organization represented, the figures tell their tale of drooping interest in it in times of peace. There are in the list only three other groups of trades in which the membership has been on the down-grade; but the proportion of loss in them is comparatively insignificant, when considered in the light of what the constituent societies of the chemical, gas, and general labourers' group have sustained in this way. It is a heavy blow to have 10,000 backsliders in one year; and such a loss cannot contribute to keeping the remainder in a state of composure.

WATER AFFAIRS.

Welsh Water in Birmingham.

THE visit of the Corporation of Birmingham last Friday to the Frankley reservoir, on the invitation of the Chairman (Alderman Lawley Parker) and members of the Water Committee, may be regarded as a fitting sequel to the Royal function in the Elan Valley last July, when their Majesties the King and Queen inaugurated the gigantic scheme which has been carried out for providing the capital of the Midlands with a supply of water from Wales. On that occasion the water was started on its course, and it duly made its appearance in the city after a week's journey. It came in quietly and, we believe, unobserved by human eye—the attendant who had been on the look-out for it being temporarily absent. Though its advent was signalized by the hoisting of the Union Jack, it was not attended by any ceremony. The visit on Friday may therefore be regarded as the public recognition of its presence and of the successful accomplishment of a stupendous task. The works then inspected, as will be seen from the description which appears elsewhere, have been constructed to store the water brought by the aqueduct, and prepare it for the use of the inhabitants. For this purpose there are at present 18 filter-beds, having a combined area of about 14 acres; and it is estimated that they will be equal to dealing with all the water which the two mains comprising what is called the "first "instalment" of the scheme are capable of bringing down the aqueduct. Should the necessity arise for the laying of any additional mains, there is ample room on the site for more filter-beds. The important work which will be done by this portion of the plant was strikingly apparent to the visitors. Between the reservoir and the valve-house there is a large open inlet chamber with hydraulic gates for controlling the flow of water into one or the other of the two sections into which the reservoir is divided. Here the new water did not by any means show to advantage, being stained almost to opacity by peat sediment. This turbid appearance was not a little disappointing to many of the visitors. At the end of the filter-beds, however, it was found to be lustrous and quite transparent; the peat stain being visible only when the water was looked at in bulk.

At the social function which followed the inspection, Alderman Lawley Parker did not fail to direct attention to this; for he triumphantly displayed a glass of water, bright and clear, from the table, and assured his guests that this was the kind of liquid they would have to drink. As a matter of fact, they had already tested its quality, for they had charged their glasses with it to honour a toast proposed by the Mayor (Sir Hallewell Rogers) expressive of their thanks to the Water Committee and its Chairman for the boon which they had assisted in conferring upon the city. That those thanks were well deserved will be acknowledged by all who read the details given by Alderman Parker in responding to the toast. The administrative work in connection with such an undertaking as that which has now happily been successfully completed was exceedingly heavy; but every detail was grasped and dealt with by the Committee and the officials, to one of whom—Mr. E. Antony Lees, the Secretary of the Water Department—Alderman Parker paid a well-deserved tribute. All concerned in this great enterprise have worked zealously and conscientiously in carrying it out; and they now have the gratification of witnessing the fruition of their labours. It has necessarily been an expensive undertaking; but its accomplishment means the relief of Birmingham for many years from anxiety as to the adequacy of its water supply. This relief, for such a city, is surely worth paying well for.

Sir George Livesey.—A serious development of the indisposition of Sir George Livesey (incidentally alluded to last week) has, we are happy to say, been arrested by a very successful operation. The latest news is that Sir George is progressing satisfactorily.

Yorkshire Junior Gas Association.—The opening meeting of this Association will be held at the University (late Yorkshire College), Leeds, on Saturday, the 29th inst., when, in addition to the ordinary business, Mr. W. Doig Gibb, the Engineer of the Newcastle-on-Tyne and Gateshead Gas Company, will deliver a lecture on the large gasholder erected by the Company from his designs at St. Anthony's, Newcastle.

GAS ACTS FOR 1904.

(*Concluded from p.* 21.)

THE Acts relating to the purchase and amalgamation of undertakings next claim notice.

By the Appleby Gas Act, the Corporation are bound to give notice to the Company, within three months after the passing of the Act, of their intention to purchase the undertaking. In the event of the parties failing in agreement, the price is to be determined by arbitration. In order to limit the expense, it is enacted that the Company and the Corporation may agree upon a single Arbitrator; also that neither the Company nor the Corporation shall be represented at the arbitration by more than one Counsel, nor that more than two expert witnesses, of whom one may be an accountant, shall be examined on behalf of either the Company or the Corporation. The remaining clauses relate to the gas-works transfer, and are of the usual character. As to the general provisions of the Act, the price of gas is limited to 5s. per 1000 cubic feet. Discounts of 10 per cent. for prompt payment, and 15 per cent. for large consumption, are permitted. The quality of the gas is 14 candles; and the burner to be used in testing is Sugg's "London" argand No. 1. The borrowing powers conferred upon the Corporation, in addition to the money required for the purchase of the undertaking, are £2000 for extensions and improvements and £1000 for working capital, together with a sum for discharging the costs of the Act. For the repayment of the money borrowed to meet the purchase price, 40 years are allowed, 30 years for the amount borrowed for extensions and improvements, 10 years for working capital, and 5 years for the costs of the Act.

The power conferred by the Sutton-in-Ashfield Local Board Gas Act of 1878 upon the then Kirkby-in-Ashfield Local Authority, to purchase such part of the gas undertaking of the former as is within their own district, is now to be exercised under the authorization of the Kirkby-in-Ashfield District Council Gas Act. Provision is made for notice of purchase to be given to the Sutton Council within two months of the passing of the Act. The limits of the gas-supply area are made to include Annesley and part of the parish of Selston. Power is, of course, given to erect and maintain gas-works, and to purchase, in addition to lands described in the schedule to the Act, an extent of land not exceeding 5 acres. The price charged for gas is not to exceed 4s. 6d. per 1000 cubic feet of 14-candle power, which is to be tested by the "London" No. 1 argand—the gas being burned at such a rate as shall give a light equal to 16 candles. For prepayment meters and fittings, 10d. extra per 1000 cubic feet is allowed; and for the hire of a meter without fittings, 15 per cent. The Council may, if they think fit, purchase gas in bulk from the Sutton Council, or from any other source. Discounts for prompt payment may not exceed 10 per cent. and for large consumption 15 per cent. Provision is made for the sale of any part of the undertaking within the district of another local authority, on six months' notice being given by the authority. Besides the money necessary for the purchase (*a*) of the undertaking, the Council are authorized to borrow £16,000 (*b*) for the purchase of lands for, and the erection of, gas-works; £12,000 (*c*) for the extension and improvement of the works; £2000 (*d*) for working capital; and a sum for the payment of the costs of the Act (*e*). The sums marked *a* and *b* are to be repaid within 35 years, *c* within 30 years, *d* within ten years, and *e* within five years.

The Act of the Shipley District Council entitles them to purchase the gas undertaking of Sir Titus Salt, Bart., Sons, and Co., Limited. The parties have agreed to a price of £33,000 for the concern; and the Council are authorized to apply to the payment of this sum the £31,000 received by them from the Bradford Corporation, under their Act of 1903, for the portion of the Shipley undertaking situated within the limits of the city. The new acquisition will simply become part of the Council's existing undertaking. Any money borrowed for the purchase beyond that already possessed by the Council, is to be repaid within thirty years.

The Ticehurst and District Water and Gas Act has for its principal purpose the amalgamation of the undertakings of the Ticehurst and Robertsbridge Water Company and the Wadhurst, Ticehurst, and District Gaslight and Coke Company. It is believed that amalgamation will lead to economy in management, facilitate the raising of capital, and be generally to the public interests. The amalgamation is to take effect from Dec. 31, from which date all the existing parliamentary powers of the two concerns will operate together. The limits of both the gas and water supply are extended so as to include Heathfield. The Company may raise additional capital to the amount of £10,000; and may borrow in respect of it to the extent of £3300.

Turning next to the General Acts promoted by Local Authorities in which sections appear referring to gas supply, there are only five falling for notice.

The Chesterfield Gas and Water Board Act partly refers to gas. Additional land purchasing powers are conferred; and new works are authorized, to which the provisions of the Board's Act of 1895 are made to apply. The illuminating power of the gas may be lowered to 14 candles. For the extension of the works

(including land) £6000 is authorized, and, as usual, for the general purposes of the undertaking, such further sums as the Local Government Board may sanction. Forty years is the period within which the money is to be repaid.

In the Doncaster Act there is little affecting the gas undertaking which calls for attention. The Corporation supply gas not only within but beyond the borough. The limits of supply are now defined; and all the necessary powers are conferred upon the Council in relation to such supply. The price for gas is not at any time to exceed 3s. 6d. per 1000 cubic feet; and the Corporation are prohibited from charging for gas outside the borough, whether to private consumers or for public lighting, any greater prices than are, in similar circumstances for the time being, respectively charged within the borough. The illuminating power of the gas is to be not less than 15 candles; and in testing it the burner is to be a 24-hole argand, or such other burner as shall be, for the time being, approved by the Board of Trade on the application of the Corporation. An excess of 10d. for meter and fittings is allowed in connection with prepayment meter supply, or 10 per cent. on the cost of the meter where fittings are not furnished. Discounts of 10 and 15 per cent. for prompt payment and large consumption respectively may not be exceeded. As to financial matters, the existing gas bonds are made statutory; and, in respect of gas-works purposes, the Corporation are authorized to borrow £40,000, and, for paying off the money secured by the existing gas bonds, £12,000. Thirty years is the period within which repayment is to be made.

The Filey Improvement Act confers, *inter alia*, further powers in respect of both the gas and water undertakings. The limits of the area of supply are extended, so as to include the parish of Muston. Several ordinary provisions complying with present-day gas legislation are adopted by the Council, among them the prepayment meter clauses (though not quite the latest) authorizing the excess of 10d. for meter and fittings, and 10 per cent. on the cost of meter where fittings are not supplied. No special clauses are included regarding finance; it being simply enacted that for the purposes of the gas and water undertakings, as extended by the Act, the Council may borrow such sums as the Local Government Board may from time to time sanction.

The Lytham District Council, in their Improvement Act, bring their powers in respect of the gas undertaking up to date; but there is nothing special or novel about the clauses.

In the extensive Act of the Rotherham Corporation is a short part referring to gas. The limits of supply of the Sheffield Gas Company and of the Rotherham Corporation are adjusted; the previous powers of both including the townships of Kimberworth and Tinsley. The Sheffield Company are excluded, by the present Act, from supplying in Kimberworth; and the Corporation are authorized to supply there and in a portion of the parish of Ecclesfield, as defined. On the other hand, Tinsley is left to the Sheffield Company. But failure to supply by either Corporation or Company within six months after demand will entitle Company or Corporation, as the case may be, to extend their mains for the purpose of giving a supply. So much of the parish of Wentworth as is situated within a distance of half-a-mile of the boundary of the borough is also now embraced in the Rotherham area of supply. The illuminating power of gas is reduced from 16 to 14 candles; while it is prescribed that the price of gas shall not exceed 3s. 3d. per 1000 cubic feet. As repetition shows is now almost customary, up to 10 and 15 per cent. discounts are permitted. In connection with electricity, a person is disentitled to demand a supply of electrical energy to premises having a separate service, unless such person has previously agreed to pay to the Corporation a minimum annual sum, so as to give them a reasonable return on their outlay. There are no other clauses of which note need be made here.

In addition to a number of ordinary clauses, the part of the Selby District Council Act relating to gas repeals a number of sections in their 1891 Order, and modernizes the powers of the department generally. The price of gas is not now to exceed 5s. per 1000 cubic feet, and 14-candle gas is allowed. The Council are authorized to supply power gas; the conditions being very much the same as those in the Matlock and District Gas Company's Act, but without their provisions as to charges. With the approval of the Local Government Board, the Council may borrow such money as is required for gas-works purposes.

The Belfast and North-East of Ireland Electricity and Power Gas Act enables the promoters to generate and supply electrical energy and manufacture and supply Mond gas for motive power and heating, but not for illuminating purposes, and to manufacture and deal in sulphate of ammonia and any other residuals. The area of supply is an extensive one, embracing parts of the counties of Londonderry, Antrim, Down, and Armagh. Powers are given for the purchase of the necessary lands, and for the construction of works. In addition to lands delineated in the deposited plans, the Company may purchase by agreement up to 50 acres. There is a notable provision restricting the displacing by the Company in the exercise of these powers of persons of the labouring class. The undertakers may not purchase or acquire in any urban district ten or more houses, which, on Dec. 15 last, were occupied, wholly or partially, by persons of the labouring class as tenants or lodgers, or, except with the consent of the Local Government Board for Ireland, ten or more houses which were not so occupied on Dec. 15, and which have been or may be subsequently so occupied. Contravention of this provision will make the Company liable to a penalty of £500 in respect of every house. The provisions controlling the supply of power gas have not undergone material change since the Bill was noticed in the "JOURNAL" for Jan. 19 last. The Company, however, have been precluded from supplying electrical energy or power gas for use within the City of Belfast; but this restriction is not to prevent the supply by the Company of electrical energy or power gas, from a station authorized by the Act to be constructed in the city, to the Belfast Harbour Commissioners for use upon their harbour works. A number of authorities and railway companies have been protected in various ways.

By the North-Western Electricity and Power Gas Act, further powers are conferred on the Company bearing that name. There is a revision of the powers of the 1903 Act as to the lands that may be taken for purposes of stations for the generation of electricity and the manufacture of power gas and residuals; and new lands are authorized. A section of the Act of 1903 prohibited the erection of stations for generating electricity elsewhere than on the lands described in the first schedule of that Act. This section is now repealed; but the Company are prohibited from constructing a station outside their area of supply. The Company are authorized to acquire by agreement Electricity Provisional Orders within their limits, and to exercise the rights conferred by them. Protection is accorded to several Railway Companies and others; but the Company have not been allowed the proposed right to pay interest out of capital for four years to an amount not exceeding £45,000—though the promoters of the Belfast Act have been, and to the extent of £60,000.

NAPHTHALENE REMOVAL.

CONSIDERABLE interest has been aroused in gas-engineering circles by the information published in last week's issue concerning Mr. Alfred Colson's process for extracting naphthalene from gas by means of what is described in the patent specification as "an improved liquid solvent," and by the success realized at Leicester during the few months' experience. With the tenor of the editorial remarks last week, that full confidence can only be obtained by greater and more varied experience, several gas engineers have expressed agreement; and no doubt Mr. Colson has found this feeling to be a very general one among the many engineers who have been to Leicester. Still it is gratifying, and it all helps to build up conviction, to know that, in the district supplied from the Aylestone Road Gas-Works, there has been continued freedom from naphthalene, and only very few cases in the district mainly supplied from the Belgrave Gate works.

There is one point, however, upon which some engineers are not altogether clear, and that is as to whether the distribution system is common to the two works. This is, of course, so. Both works are joined up by trunk mains, with innumerable connections about the town; so that practically the whole of the lighting area, with the exception of a few outlying districts (supplied from Belgrave Gate only), can be supplied from either the one works or the other. So much more gas is now being made at the Aylestone Road works than at the old works, that the latter are backed-up for some hours every day, during which time, the treated gas from Aylestone Road freely circulates throughout the distributing plant which, at other hours, is fed from the Belgrave Gate works; and there is no doubt, in Mr. Colson's mind, that it is this intermixing of gases that accounts for the very few cases of naphthalene now being obtained in the Belgrave Gate district. There has, however, never been so much trouble in that area as in the Aylestone Road one; but at the same time Mr. Colson is convinced that, were it not for this intermixing, the complaints received from the Belgrave Gate district would be considerably greater in number than they are. Of course, the points in the distributing plant at which the supplies from the two works overlap and intermix must be ever varying; and it may be that even now a few cases of naphthalene may be obtained in that part of the area usually taken as being supplied from Aylestone Road. Up to the present, however, there has been absolute freedom.

THE PATENT SPECIFICATION.

The process, as mentioned last week, is covered by a patent applied for by Mr. Colson; the date being July 29, and the number 16,766. The complete specification filed with the application for the patent having now been accepted and sealed, we are to-day enabled to give the main points of it, in the inventor's own words.

Hitherto, he says, many attempts have been made to remove the naphthalene, on account of its objectionable property of becoming condensed in the service-pipes and mains and causing stoppages; but great difficulties have arisen in effecting the removal because of the varying composition of the gases obtained from different grades or classes of coals, and the unsuitability of the solvents used, which result in the fact that means which will work in one place are practically useless in another.

The object of the present invention, therefore, is to provide a solvent which is capable of practically removing naphthalene from illuminating gas produced by the destructive distillation of coal or oil; and it consists in "an improved solvent liquid capable of

removing naphthalene with certainty from illuminating gases obtained by distillation, and in a method of preparing this liquid." The invention also consists in treating the gases with the liquid in a manner to be described.

In carrying the invention into effect, the patentee proposes to take as the raw material coal tar, oil tar, blast-furnace tar, or (generally) any tar which is formed by the destructive distillation of carbonaceous matter at high temperatures. Such tar is first subjected to the customary preliminary distillation, and the portion which distils over below about 270° C. (518° Fahr.) is then subjected to one or more further distillations in order to isolate a mixed oil consisting chiefly of constituents of the tar having a boiling point between 170° and 215° C. (338° and 419° Fahr.) and containing only small quantities of naphthalene, which boils at 219° C. (426° Fahr.). The number of such distillations required will vary according to the composition of the tar originally taken. The oil thus obtained is "capable of extracting naphthalene from the gas rapidly and with certainty."

It is preferred to remove the commercially valuable constituents of the first distillate from the tar—such as carbolic acid, crude naphtha, and heavy naphtha—before subjecting it to further distillation for the preparation of the naphthalene solvent.

For example, in the case of coal tar derived from Midland gas coals, the following procedure is found suitable: The distillate from the tar is collected until its density is about 1030; and from this the carbolic acid, crude naphtha, and heavy naphtha are removed by any known means. From the residue, consisting of creosote surcharged with naphthalene, the required oil (which may be described as a light creosote containing a little naphthalene) is obtained by twice distilling. The density of the oil thus prepared is 994 to 998, or even a little heavier, and about 200 gallons are obtained from 1000 to 1200 gallons of creosote.

The washing of the gas with the oil is best carried out in some form of washer wherein the gas, previously cooled to about atmospheric temperature, is compelled to travel through the liquid in fine streams—such as a Livesey washer. Under these circumstances, the oil gives rise to great frothing, and so exposes the gas to a very large surface of the liquid and effects the rapid removal of the naphthalene.

When the oil becomes saturated with naphthalene, it is removed from the washer and replaced by fresh solvent; the spent oil being either again subjected to distillation in the manner already described or run into the tar-well.

It is considered desirable by the patentee that all mechanically suspended tarry matters should be completely removed from the gas before it reaches the oil-washer, as otherwise such particles will be removed by the solvent oil, which will become saturated thereby much sooner than would otherwise be the case.

In carrying out the process, the patentee does not consider it necessary for the whole of the gas to be washed from the oil in the manner described, as he finds after such treatment that the washed gas may be mixed with a considerable quantity of untreated gas containing naphthalene, without danger of the subsequent deposition of naphthalene in the solid form from such mixed gas.

The claims made for the invention are: 1. An improved solvent for the removal of naphthalene from illuminating gas, consisting of a mixed oil prepared from a tar formed by destructive distillation of carbonaceous matter at high temperatures by two or more distillations. 2. Treating the whole or part of the gases with the solvent in the manner described.

Correspondence on Mr. Colson's Claims.

As was expected would be the case, letters have been addressed to us calling attention to other processes of the same genus; and some surprise has been expressed that, in dealing with Mr. Colson's method, mention was not made of the good work already done by others in the washing of gas for the removal of naphthalene. Every naphthalene or other process or claim has a right to an independent introduction to the gas profession; and fortunately it does not come within the region of journalism to decide whether one process is or is not a copy of another. That is a matter for those to deal with who hold the rights in them. The statements in the editorial last week were guarded, while giving Mr. Colson the full benefit of his success at Leicester. The extent of his claims may now be precisely gathered from the copy of the specification printed above; and it will be seen that the "improved solvent" is the feature of the invention. This was pointed out in last week's editorial when it was said that "the solvent he employs is not a creosote, neither is it any other up to now commercial product." Young and Glover employ heavy tar oils; Bell washes hot gas with hot tar, finishing with naphtha; Leather uses creosote oil. The solvent employed by Mr. Colson is defined above. A point not brought out last week, and which should in fairness to Mr. Colson be stated now, is that, before he made public what he has been doing at Leicester, he consulted some of the highest experts in the matter; and all thoroughly agreed that the process was sufficiently novel for a patent. If finality in relation to this naphthalene problem had been reached before the publication in last week's "Journal" (we do not say it has been now), it is somewhat surprising that the Naphthalene Committee of the Southern Association and Dr. Colman should continue to waste their time (as they would then be doing) over the matter.

The following are letters sent for publication, to which we have pleasure in giving prominence.

Sir,—Since reading the "Journal" of Oct. 4, and the glowing description and references to the "Colson Patent Process for Removing Naphthalene from Coal Gas," I have looked up the paper contributed jointly by Mr. William Young and myself in 1896, also the patent granted to Mr. Young, Mr. Samuel Glover, and myself, in the same year. The process of absorbing naphthalene by means of specially prepared oils derived from coal tar, but freed from naphthalene and used as water is used for absorbing ammonia, is clearly explained in both cases.

Not only so, but, since that paper was read and the patent was granted, the absorbing or washing-out process by the use of creosote freed from naphthalene has been practised both in this country and in Germany—in this country usually by arrangement with the patentees, but in one or two cases, I believe, without an acknowledgment. In Germany, the Patent Office declined to grant a patent to Dr. Bueb, on the ground of anticipation by the English patent to which I have referred.

No gas engineer or gas-works chemist who has conducted even a superficial investigation into the question of naphthalene stoppages, doubts the success of the washing-out process to prevent subsequent deposits, as it is evident that when the naphthalene vapour is removed from the gas at the works, it is impossible for it afterwards to deposit as a solid.

The experiences at Leicester are, therefore, just what might be expected. There is nothing whatever in the results to occasion surprise, nor need it be doubted that where similar means are adopted, equally beneficent results will follow. The results, as far as oil used per 1000 cubic feet treated, could be improved by the use of apparatus more suited than the Livesey washer is to this purpose.

It is somewhat surprising, however, that an engineer with a great reputation should, at this late hour, seek to patent a process already covered and in use at numerous works, and that the writer of the article in the "Journal" should have such a short memory.

Norwich, Oct. 8, 1904. Thos. Glover.

Sir,—I read with interest the account in this week's "Journal" of the "Colson Patent Process for Removing Naphthalene from Illuminating Gas;" but think it would be more correctly described as the "Derby" process for the removal of naphthalene deposits, which has now been in successful operation at both our works for over twelve months, and in other towns with most satisfactory results, and was referred to by the Chairman at the last annual meeting of the Derby Gas Company—"Journal," Vol. LXXXV., pp. 391 and 419.

It is ten months since my process was fully described to Mr. Colson at Derby; and later a partial trial was made at Leicester. The results obtained there, I was informed, were not equal to what we are getting at Derby; but as the time of the year at which naphthalene is troublesome had passed, Mr. Colson decided to discontinue its use.

After carefully reading the description of the process which Mr. Colson claims is new, and for which it appears patent protection has been applied for, I cannot but observe the similarity between the two processes; and it appears to me the Leicester method is, to all intents and purposes, practically identical with the essential part of the "Derby" process.

If the claimed discovery by Mr. Colson was on entirely new lines, I should have been only too glad to join in congratulating him upon his success, although I hold, after the work which has been done by so many investigators in gleaning information and fully giving to the profession the results of original research on the naphthalene question, any attempt to patent a process must have very strong claims to originality before it can secure a valid patent or hope to obtain a royalty for its use.

My process consists of first eliminating, as far as possible, by warm tar washing, the naphthalene from the crude gas, and then washing with a solvent obtained from coal tar having a great affinity for naphthalene, and which upon condensation brings down the few remaining grains.

It is this second part of my process which Mr. Colson has appropriated without even acknowledging the fact. I claim to be the first to recognize the importance and bring into use a natural solvent that the gas will absorb and carry forward—thus preventing naphthalene being deposited in a crystalline form, which is the cause of all the trouble and annoyance to consumers.

Mr. Colson washes a portion of the gas (varying from 50 to 60 per cent.) in a Livesey washer placed after the scrubbers, with a solvent obtained from coal tar consisting mainly of oils having boiling points between 170° and 215° C.; whereas I wash the gas at the same point with a solvent obtained from coal tar which consists of oils having boiling points mainly between 150° and 205° C.

I now leave your readers to judge where the so-called great discovery comes in. I hope in next week's issue to enter more fully into the application of the use of natural solvents obtained from coal tar for the removal of naphthalene deposits; and, with your permission, I will give the results of a year's work at Derby upon the whole of the gas supplied to some 23,000 consumers.*

Derby, Oct. 8, 1904. J. Ferguson Bell.

Sir,—I was much interested when perusing your last issue to find that Mr. Colson had been so successful in dealing with his

* The suggested communication will be received with much interest.—Ed. J. G. L.

naphthalene troubles; but as he is a maker of carburetted water gas, I think he might have obtained the same satisfactory results in a much simpler way, and so have saved the trouble of that elaborate process of tar distillation.

After trying various methods for getting rid of the naphthalene nuisance, and obtaining a little relief from some, and no benefit from others, I decided last July to wash the gas with the light tar obtained from the carburetted water-gas plant. This arrangement of working I commenced at the end of July, and shortly afterwards the complaints from naphthalene began to diminish, until at last towards the end of August they entirely ceased; and during the whole of September, and up to the present time, there has not been a single complaint from naphthalene. During August, 1903, we had 366 complaints; for the same month this year, there were 87. For September, 1903, the complaints numbered 129; while this September, and up to the present time, there has not been a single one.

My system of working is to introduce into the top of a Walker's washer, 4 inches (about 120 gallons) of light carburetted water-gas tar, chiefly that pumped from the syphons. The gas is allowed to bubble through the light tar, and each morning about 4 inches of thick tar are run off from the bottom of the washer and 4 inches of the carburetted water-gas tar added at the top. The washer is placed on the outlet main of the exhauster, and before the Livesey washer; and the temperature in it is kept at about 75° to 85° Fahr.

I should like very much if any others who are troubled with naphthalene and are makers of carburetted water gas would give the above arrangement a trial; it is so easily applied, and has certainly so far proved efficient here.

Scarborough, Oct. 7, 1904. ALEXANDER ALLAN.

SIR,—I read your description of Mr. Colson's process for the treatment of naphthalene stoppages in last week's "JOURNAL" with much interest.

There is no doubt an advance has been made towards a solution of the difficulty. The oil Mr. Colson uses will absorb part of the naphthalene out of the gas without taking out other light oils which are solvents of naphthalene, and which I think was the fault of other methods recommended—viz., to wash the gas with heavy oils and creosotes. I tried washing with heavy oil last year; and although I reduced the naphthalene in the town's gas, the stoppages increased and became worse as I continued the process. This being contrary to what was expected, I made tests for the quantity of light oil vapours distilling between 130° and 170° C., and found that, before washing with the heavy oils, the gas contained some 6 to 8 c.c. per 100 cubic feet. But after washing with the oil, most of this distillate disappeared; and this I think would account for the increased number of stoppages found.

This year I have tried Mr. Bell's "Derby process," with a few slight alterations. The condensers are worked to reduce the naphthalene down to about 4 grains per 100 cubic feet; and the temperature of the outlets is kept as near as possible at 70° to 75° Fahr. After the exhausters, the gas goes through a Livesey washer, to which is added each morning sufficient "heavy naphtha" to keep a layer of oil 1½ inches deep floating on top of the liquor (the overflow cock is kept closed). The gas, foaming through this, takes up some 10 c.c. of light oil vapours per 100 cubic feet, which distill between 130° and 170° C.; and we find, on further carefully testing the town's gas, a total quantity of 16 to 17 c.c.

This process was started early in May; and for three or four weeks afterwards little benefit was felt. Then a gradual falling off was noticed; and I am glad to say that, for the last three months, we have not averaged one stoppage per day.

Bury, Lancs., Oct. 8, 1904. HY. SIMMONDS.

Covered sand filters have been recommended for the purification of the Mississippi River water supplied to Minneapolis. Messrs. Andrew Rinker, F. W. Cappelen, and Allen Hazen advise the construction of 16 filter-beds, with an effective area of 13½ acres, and a covered clear-water reservoir of 20 million gallons capacity. This plant will be sufficient to furnish 30 million gallons daily, and, with new conduits and other appurtenances, will cost about $1,276,000. This is more than a mechanical filter system of equal capacity would come to; but the latter is estimated to be so much more expensive to operate in Minneapolis, that the final cost of the filtered water per million gallons would be greater from such a plant than from the slow sand system recommended.

In the "Comptes Rendus," M. Simon has shown that, on adding to a dilute solution of hydroxylamine or oxyammonia (NOH_3) $HO(NH_2)$ a few drops of a very dilute solution of sodium nitroprusside and a faint excess of alkali, and heating the mixture gradually to the boiling-point, the liquid loses its yellow tint, and finally assumes a fine cherry-red colour, which changes to a bright rose on dilution of the solution. The reaction is very sensitive, a visible colouration being obtained with a solution of one part of hydroxylamine hydrochloride in one million parts of water. The colour is only transitory, and disappears more or less rapidly according to its intensity. All the salts of hydroxylamine yield this reaction, which is, however, not given by oximes, whether aldehydic or ketonic, aliphatic or aromatic.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 130.)

THE Stock Exchange has had a fairly satisfactory week. Business was not over and above active; but there was a cheerful feeling all through, and prices were for the most part rather better, in spite of some little fluctuations and a disposition to realize a profit when it could be seen. The gilt-edged division was in good demand. The cause of the general buoyancy proceeded from the Money Market, where a superabundant supply produced a position of extreme ease. Day-to-day transactions were done as low as 1 per cent. A feature of the week was the issue of £6,000,000 Exchequer Bonds, which were tendered for to the extent of about three-and-a-half times this amount. There is a general impression that easy money is likely to rule for some time. Business in the Gas Market was very fairly active; and the volume of transactions included issues not usually dealt in to any large extent. The tendency was quite favourable, and several stocks of all classes scored moderate advances. In Gaslight and Coke issues, there was good, steady business in the ordinary at prices which gradually hardened from 94½ until the close, when parcels changed hands more than once at 96. The quotation, however, was not advanced. A moderate amount was done in the secured issues; but prices were not remarkable. South Metropolitan was dealt in daily at even prices, ranging from 125½ to 126½. Nothing at all was marked in Commercials, except one bargain in the debenture stock, which was let go at the low figure of 83. Debenture stocks have been very flat for some time past; but cheap money ought to give them an upward move. In the Suburban and Provincial group, transactions were up to recent averages, and several issues scored an advance, notably Bournemouth, Brighton, South Suburban, and Tottenham. The debenture stock of the latter Company, which had some time ago dropped out of quotation, is now restored to the list. Among the Continental Companies, Imperial was firm, and changed hands once at top price. European was in demand at an advance; but sellers would not be tempted. Union continued flat, and was marked "specially" as low as 102. Among the remoter undertakings, the most conspicuous was Primitiva, in which there was unusual activity in both the ordinary and the preference shares; and the former had a smart rise. Oriental had a further advance of a couple of points.

The daily operations were: Business opened rather quiet on Monday; and prices were steady. Primitiva ordinary rose ¼. Tuesday produced no greater activity, and quotations were left unchanged. On Wednesday, there was more animation; and prices advanced freely. Brighton ordinary, South Suburban ordinary and preference, Tottenham "A," and Oriental improved 2 each. Thursday was rather quieter. Commercial debenture was ½ lower. Friday was very active; Primitiva being especially busy. Bournemouth original rose 1, and European part paid ½. Saturday was pretty active, considering the general quiet of the day; and Primitiva advanced another ¼.

ELECTRIC LIGHTING MEMORANDA.

Unhappy Dublin—Mr. Robert Hammond's Position—Depreciation and Renewals—Municipal Loans and Departmental Oversight and Anxiety—Editorial Carelessness and Vulgar Abuse—The Wrexham Scheme.

IN the matter of their electric lighting undertaking, the Dublin Corporation have not succeeded yet in entirely escaping from their unhappy experiences. Relief from one trouble only lands them in another. Counsels are divided; but outstanding from the confusion is the patent fact that the Council have done with Mr. Robert Hammond. This statement will perhaps be regarded as a little premature, seeing that gentleman's celebrated report, including his sporting offer, which was commented upon lately in the "Memoranda," is not to be discussed by the Council before the November meeting. But nothing more is wanting than a vote in the Council last week on a question affecting the Electric Lighting Department, taken in conjunction with certain remarks, to satisfy one as to the direction of the wind. Some of the speakers' rhetoric on this occasion will not be imbibed with relish by Mr. Hammond on his return from his American trip with the electrical engineers. If he really believes—and the egotistical strain in which his report is written leads one to suspect that he does—that he is the redeemer of the Dublin electricity undertaking, then we are afraid that he will presently have a very rude shock. Quite naturally the City Electrical Engineer (Mr. Ruddle) has not liked playing second fiddle to Mr. Hammond; and his reports on those of the Consulting Engineer have assisted to add piquancy to the situation. He has not been slow to point out what he conceives to be their weaknesses, and the extravagance of the claims by the temporary commander in-chief. The Electric Lighting Committee and the Council have found themselves confronted by two stools; and now there is not much uncertainty that they are going to seat themselves on the one put out for them by Mr. Ruddle.

If this prediction does not turn out correct, then we are incapable of reading what appear to be very transparent indications. The Council considered last week a report by Mr. Ruddle on

improving the supply of electricity in the old electric lighting area by the laying of new mains at a cost of some £1300. About the necessity of improvement, there is not an atom of disagreement between Mr. Hammond and the City Electrical Engineer. As a matter of fact, the proposals were Mr. Hammond's; and, while Mr. Ruddle does not agree with his general scheme, he sees very clearly that something must be done. So far the right road was plain to the Council; and this particular point may be dismissed with the statement that the report was carried by 42 votes to 14. In the discussion, however, there was some doubt as to the position of Mr. Hammond—as to whether that gentleman will be able to claim his percentage fees on the work. The devout hope was expressed by Alderman Reigh that Mr. Hammond would receive no more percentages; and Alderman Ireland did not mince his view that the sooner Mr. Hammond's services were dispensed with, the better. "Every time he (the Alderman) attended the Committee, he was more and more convinced that this ought to take place as soon as possible." Again, Mr. Hammond appeared "to him to be playing with the Corporation; while the other was doing his very best to discharge his duty faithfully and morally as the City Engineer." There were two or three who stood up for the absent Consulting Engineer—Mr. Harrington, M.P., being one. His opinion was that Mr. Hammond is entitled to carry out the work; while another member was for getting an opinion on the subject from the Law Clerk. The question of fees is a small one, compared with the urgency of the matter; and so thought the majority of the members. According to Alderman Cole there has been "pretty hot work" with the redoubtable Mr. Hammond in Committee; and the Councillors may depend upon it there will be further "hot work" when that gentleman returns reinvigorated from his American tour. Meanwhile, after all that has been done, Mr. Ruddle computes that an expenditure of £25,000 has to be faced before the electric lighting of the city can be said to be in proper condition. The ratepayers will be glad to see the end of the expensive process of setting in order their electricity house.

The Southampton Corporation have had a gentle rap over the knuckles, from their Auditors (Messrs. Cash, Stone, and Co.), respecting the provision for reserve and renewal funds in connection with both their tramway and electric light undertakings. It is rather a question of insufficiency here than entire neglect. Both in respect of the tramway and electric light concerns, reserve and renewal funds are an absolute necessity, as in both it is believed that substantial sums will have to be expended on large renewals long before the statutory sinking fund will have provided for the amount of the original expenditure. The sum standing to the credit of the tramway depreciation fund is only the inadequate one of £7289; and the Corporation are advised that no further sum in aid of the rates should be appropriated until a sufficient amount has been placed to a fund to provide for all reasonable renewal expenditure likely to be required in the next four or five years. The amount of the electric light depreciation and renewal fund is the insignificant one of £1410. In this case, however, a relatively large sum in respect of capital expenditure has been, during the past financial year, provided from revenue, and no appropriation in aid of the rates has been made. While, therefore, the Auditors hesitate to say that proper provision has not been made during the year, they recommend that the renewal fund should also be increased in this department so as to cover all large renewals during the next four or five years. The advice tendered by Messrs. Cash, Stone, and Co. is wise; but it is advice that, in the case of a large proportion of municipal electricity concerns, runs like rain off a duck's back. There are municipal tramway and electricity undertakings in which proper provision is made for depreciation; but these are only found among the more prosperous. Southampton may be sinners in this respect of inadequate provision, but they are not the greatest. If the sound financial principles proffered to Southampton were accepted by the majority of those who have the management of the municipal electricity works of the country, there would be fewer even than there are now who would be able to show that dearly loved item of net profit in their balance-sheets, and would be shorn of the delight of handing over a little something in relief of the rates. There will be a day of dire reckoning for present neglect.

Talking of the relief of the rates, it is pretty evident that the Government departments are heeding the cry raised over the incessant increase of local burdens. There is the Wood Green example; but there the Council will, it seems probable, politely inform the Local Government Board that they intend to adhere to their policy of obtaining a municipal supply of electricity. Though what good that will do is not at present clear. Now the Board of Trade have refused to accede to the desire of the Dartford District Council for a licence to supply electricity to Wilmington. The Public Works Loans Commissioners, too, are evincing anxiety—in fact, they have done so for some years past—on account of the continuing increase in the rates levied in many districts from which applications have been made for loans. During the last financial year, they have felt obliged from this cause, to refuse certain applications (not specially with reference to electricity supply) which have been made to them for loans, and in others to warn the applicants that future applications will probably not be entertained unless a reduction is shown in the rates levied. The Board are under statutory obligation to have regard to the sufficiency of the security for the repayment of their loans. Where the rates are exceptionally high, and there appears to be no probability of any decrease, the security offered is impaired; and the Board would not be justified in accepting it as sufficient for a loan of public money. These are, so far, satisfactory evidences of a stricter oversight in the matter of the expenditure of local moneys by municipal authorities. All we wish is that a little more strictness had been exercised over the purse strings a few years ago; the ratepayers of numerous districts might then have been better off in the matter of rates than they are to-day.

The Editor of the "Electrical Engineer" finds himself in a ludicrous position over the pretty little homily addressed to the "JOURNAL" in his issue of Sept. 30; and he essays to screen that position (in which a piece of editorial carelessness is involved) by vulgar abuse, with scraps of poetical relief. From the homily to the vulgar abuse is a long jump; but the Editor takes it with an ease, with which we have no desire, and will not attempt, to compete. It now appears that the homily was contributed (the Editor speaks of "our contributor"), and was adopted as an editorial, and the very kernel of it was a misstatement which want of editorial care allowed to be published. The homilist's charge against us was, as mentioned last week, that we did not recently tell the whole truth about Erith—that we hid up the fact that the last financial year at Erith, which ended with a deficit of £781, happened to be the first financial year of a young undertaking, *and that the deficit, after paying capital charges, amounted to* £1801 16s. 8d." From the midst of the wrathful outpourings of the Editor of our contemporary, we gather that, after all, our original statement was right that £781 was the deficit, and not the £1801 16s. 8d. mentioned above. The latter sum, we are now told, is the amount of the capital charges, after paying which the deficit of £781 is arrived at. This is what we had believed to be the case until the definite but confusing misstatement in the "Electrical Engineer" effusion of Sept. 30 was rushed over to us on that day almost hot from the machine, so anxious was the Editor to let us have a bit of his or somebody else's mind. The Editor calls the misleading statement "an involved sentence" and an error in "grammatical construction." It would have been "the truth, the whole truth, and nothing but the truth" if he had acknowledged it to be an effect of downright careless editing, for which the man who adopted the contributed homily is responsible. Because we placed absolute reliance upon the editorial statement, and naturally did not think it necessary to go rambling through the news items of the paper for corroboration, the Editor treats us to a sample of his power at pungent revilement. It would have been more in accordance with propriety and good editing if he had himself referred to his own news columns and rectified the error, instead of allowing the appearance, in the leading columns, of what he himself now proves to be an absurd piece of negligence. It so happens that the original financial statements of electrical undertakings do not, with great frequency, get addressed to the office of the "JOURNAL OF GAS LIGHTING." Therefore, for some of the results of the working of these undertakings, we have to rely upon electrical contemporaries; but the "Electrical Engineer" is not one of them. The Editor describes this as "delving in the dirtiest of literary ditches;" the "dirtiest of literary ditches" being his electrical contemporaries. They will no doubt be glad and amused to know the estimate which the Editor of the "Electrical Engineer" has formed of their character. We are satisfied to go on delving in those "ditches;" for in them hard knocks and badinage we have often found, but never, in controversy, anything to equal the bad taste displayed by the "Electrical Engineer" this last week. In his final sentence, the Editor remarks: "Before trying a fall with the 'Electrical Engineer,' be sure of your facts." We can heartily commend the latter words to him in editing homilies forwarded to him by "our contributor."

There is further evidence of the desire to rush the question of the extension of the electricity distribution system at Wrexham, and to bolster up the unprosperous undertaking with further street lighting largely composed of incandescent electric lamps. The consideration of tenders, it will be remembered, had to be postponed at the previous meeting through a legitimate technical objection; but a special meeting was hurriedly called for Monday last week for the discussion of the matter. A tender for cables for one comparatively small portion of the work has been accepted. But for the larger section, there was a division of opinion over two competing tenders; and the Electrical Engineer refused the guiding word as to which cable he preferred. Either would suit him. The *crux* of the matter was as to whether a separator is necessary between the vulcanized bitumen and the copper conductor; and as the Council could not obtain satisfaction on the point, they resolved to consult an expert (Mr. Trentham) so as to dissolve the doubt. It is a pity that they do not at the same time also obtain a little light and leading on the question of the relative merits of incandescent gas-lamps and incandescent electric-lamps for street lighting—say, from Mr. Preece, if they do not care to spend a little money on a report from a gas expert.

The Newcastle Association of Students of the Institution of Civil Engineers, through the invitation of Mr. A. L. Forster, the Engineer of the Newcastle and Gateshead Water Company, lately visited the new pumping-station at Benwell, and inspected the plant, which is designed to deliver 1563 gallons of water per minute against a total head of 240 feet.

THE LESSON OF A STRIKE.

THERE have from time to time been welcome proofs that the spirit of independence which the principles whereon present-day Trade Unionism is founded have of necessity done so much to imperil, can still assert itself under pressure of circumstances. This is a serious factor for these organizations to take into calculation, and one which, if it continues to develop, must in time entirely destroy the usefulness of the system as a fighting machine. It has all along been recognized that, if the Unions were to be permanently successful, it could only be through the sacrifice by the workman of his undoubted right to sell his labour to whom, and at what price, he pleased. Those within the Union must blindly obey its dictates; and those outside must as far as possible be "persuaded" to join. The fact that so many men have preferred to retain their freedom of action has been always a source of weakness to the Unions; and thus no doubt it is that strenuous, harsh, and sometimes it must be admitted cruel, efforts have been continuously made to bring them within the fold. Now the trouble caused by the independence of Unionists themselves threatens to assume an acute form.

A few days since, a strike of cardroom hands and spinners at an Ashton-under-Lyne mill came to an abrupt termination; the spinners having held a meeting at which they decided to throw over their Union and return to work on the old terms. This they subsequently did; and the settlement of the dispute in this way by the men themselves is stated to have given rise to the greatest satisfaction in all quarters of the town. An equally notable instance of the growing tendency of workers to take matters into their own hands has occurred in connection with the long-drawn out strike at the Marquis of Bute's collieries at Hirwain. About twelve months ago, the men employed there stopped work with the familiar object of compelling a few of their fellow-workers to join the Union; and when they had succeeded in this, they were anxious to resume their occupation. To their surprise, however, the Agent (Sir W. T. Lewis) declined to allow them to do so until compensation had been paid for the damage done to the property by the stoppage. The weary year that has since elapsed has given the men ample time to repent of the extreme steps they took to coerce the non-Unionists; but it does not appear in any degree to have assuaged Sir W. T. Lewis's anger at the tactics of the Miners' Federation. Up to the end, he definitely declined to meet the agent who was appointed by the Executive Council to accompany any deputation that might wait upon him; and consequently the men finally, by an overwhelming majority, decided to seek an interview with Sir William with a view of discussing the position of affairs without taking into consideration any assumption on the part of the Federation to have a voice in the negotiations. The interview which took place was private; but a meeting of the men was subsequently held at which the terms of the agreement were explained. These were that, if the men could agree among themselves, work should be given to the hundred men who had been idle during the whole period of the stoppage, in return for a turn per fortnight for three months—that is to say, six days in all—without payment, as a contribution to the cost of re-opening the workings. This amount of compensation was offered by the deputation themselves, on Sir William stating that they were all aware of his original attitude, from which he was not prepared to depart.

Thus the men have done, after twelve months, what they might just as easily (and with very much greater profit to themselves) have accomplished at the beginning of the struggle. Their only gain has been experience—which in this case has been "bought" at an even heavier price than usual; the loss in wages being computed at £35,000, while the cost to the Federation and district has been £6000. Sir W. T. Lewis, on the other hand, cannot fail to reap a substantial reward for the firmness he has displayed; and the thanks of all employers of labour are due to him for the manner in which he has upheld, first, the right of men to remain non-Unionists if they choose, and, secondly, the right of property owners to compensation for loss caused by a wilful stoppage of work. Indeed, this excellent lesson appears already to have been taken to heart; for the miners at the Lewis-Merthyr Colliery, at Hafod, in the Rhondda Valley (of which colliery Sir W. T. Lewis is practically the owner), have, by a majority, refused to hand in notices to cease work owing to the presence of fifteen non-Unionists among their number.

Meanwhile, this increasing tendency towards a more enlightened policy on the part of the men is apparently causing serious alarm to the officials of the Federation; for Mr. W. Abraham, M.P., has been holding out the threat that, if the non-Unionist difficulty continued, the Federation could sue the defaulting workmen in Court for their proportion of the expenditure incurred in carrying out the terms of the agreement which the coal owners' representatives had compelled them to sign, not on behalf of the members of the Federation only, but on behalf of all the workmen employed at the collieries. Whether or not such a way out of the trouble does really exist, is for Mr. Abraham to find out; but if it does, this mode of procedure would surely be far preferable to the short-sighted, disastrous policy of endeavouring to compel everyone to join the Federation by the crude and ruinous process of "striking." A stoppage of work costing the men perhaps thousands of pounds in wages, seems an unjustifiably expensive means of collecting subscriptions from a handful of would-be non-Unionists—even if it is successful.

GAS AND ELECTRICITY IN THE COLONIES.

By W. G. QUICKE, of Perth, W.A.

I have been interested by the comments, in the "JOURNAL" for Aug. 9, on the article by Mr. John Roberts, of Durban, South Africa, which was published in the "Electrician," and can endorse his statements on the question of producing current cheaply in Colonial centres in comparison with European cities.

The primary reason is not far to seek when one understands Colonial extravagance in general, where large communities are quickly brought together, permitting the erection of plant that would not pass muster in more staid communities—the wider streets admitting the erection of poles and lines. This is infinitely a cheaper method than the underground system, and is undoubtedly the most important factor in determining the cost from the power house to the consumer—making it compare so favourably with less progressive centres, as in Europe, where generally the streets are much narrower in proportion to the population and traffic, and consequently do not permit the overhead system. Not only is the overhead system cheaper, but the economy in upkeep is far below. The number of hands are half that required for a corresponding output with the underground system. The lines are at all times accessible to the workmen at any point; and, notwithstanding the higher price for labour in the Colonies—given a reasonable supply—there is no difficulty in producing current from 9d. to 1s. per unit to pay 10 per cent. In Western Australia, we have small communities, municipally conducted, where 8d. per unit is charged. We have local lignite coal of fair steaming value, which can be delivered to the boilers at an average of 14s. per ton. To this may be added say ½ ton of bituminous coal, costing 20s., which means practically 15s. 6d. per ton for fuel. At these prices, current is supplied here for 7d. per unit, graduating down to 4d. to large power users. This is, considering the cost of labour and plant, even lower than in English centres.

Notwithstanding these apparent advantages—owing largely to efficient production, supervision, and maintenance—gas has yet to be proved of greater cost comparatively than electricity. Taking 7d. as the average charge for lighting, then 1d. per hour represents 36·5-candle power. Gas is distributed here in Perth, Western Australia, at for lighting, 9s. 2d. per 1000 cubic feet, and for heating and power 6s. 8d., less 10 per cent. before the 15th of the month. At this figure, the ordinary Welsbach burner—using 4 cubic feet per hour, and giving 70-candle power—renders service to the extent of 175-candle power, at 1d. per hour. The Lucas lamp, at 20 feet per hour, reaches 350-candle power for 1d. per hour (the English-made, or imported type, does not reach this standard). These figures are available to all interested; and, even with gas at double the price named—a large enough margin—electric current would still be behind.

For power purposes, unless the service required is intermittent, when any practical user must have electricity, gas still holds the palm for economy, as, taking 20 cubic feet per horse-power-hour (which is a reasonable margin for defective working), at the above price, 5s. 10d., it equals 1·4d.; whereas electric current, at 4d. per 1000 watts, equals 2·98d. per (746 watts) horse-power-hour. That is more than double the price; and when the gas motor runs steadily all day between regular fixed hours, its advantage really is apparent.

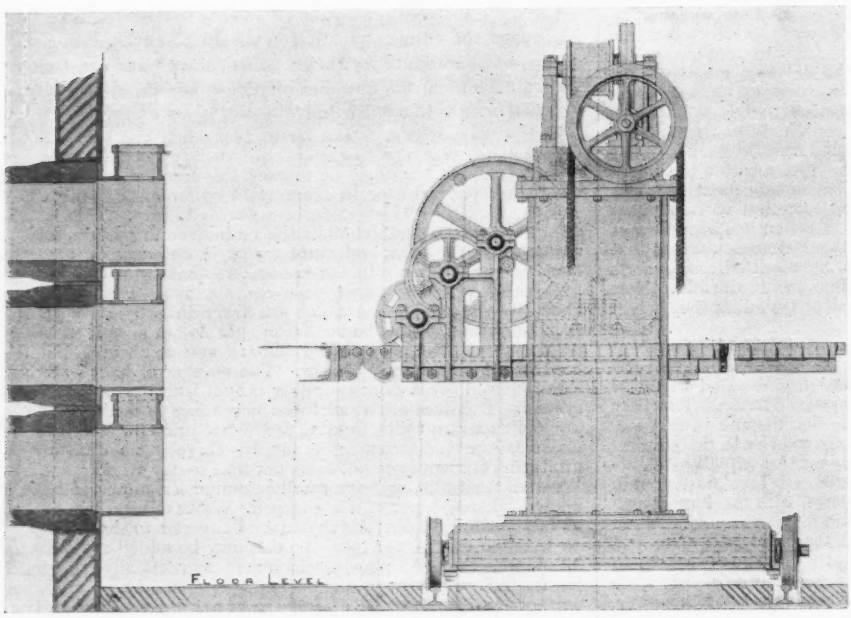
The points of advantage are in the small space, convenience, and portability of the electric motor up to $2\frac{1}{2}$-horse power, which with prime cost is a great consideration to a small business. Or even in a workshop, where a number of machines are placed, the margin of saving by using separate motors attached to each is considerable; but to assert that gas is more costly is to be behind the facts.

That large power gas-engines and producers will ultimately command industrial centres for all purposes as the prime generator of power is, I think, inevitable; and in view of the many large plants now working at low cost on this system, alternators must follow.

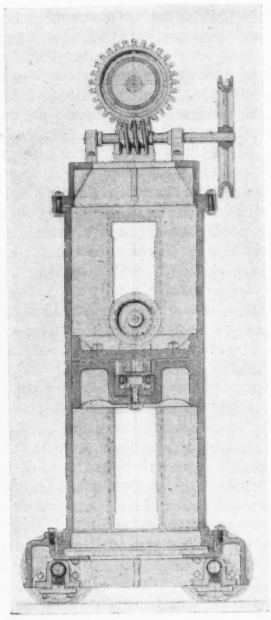
Some three years ago, before the Coolgardie water scheme had assumed any noticeable proportions, it was my endeavour to impress this fact on mining engineers and managers at the goldfields, as, owing to the price of fuel and the quality of the water, steam-boilers were an enormous expense. Yet the reluctance to abandon this system, even under the adverse conditions which obtain in these waterless mining centres, is still maintained; and nothing at present appears to convince the average engineer to the contrary.

In the "Zeitschrift für angewandte Chemie" for the 16th ult., Herren Bamberger and Böck describe a respirator to enable workmen to escape from places where there are poisonous gases. Most devices for this purpose have depended upon the use of compressed oxygen in cylinders, and have consequently been very heavy. In the respirator under notice, use is made of a solid which absorbs the products of respiration, carbon dioxide and water, and in so doing gives off fresh oxygen. The substance employed is sodium peroxide, or better still, sodium potassium peroxide ($NaKO_8$). An account is given of a number of practical trials, which are stated to have been very successful.

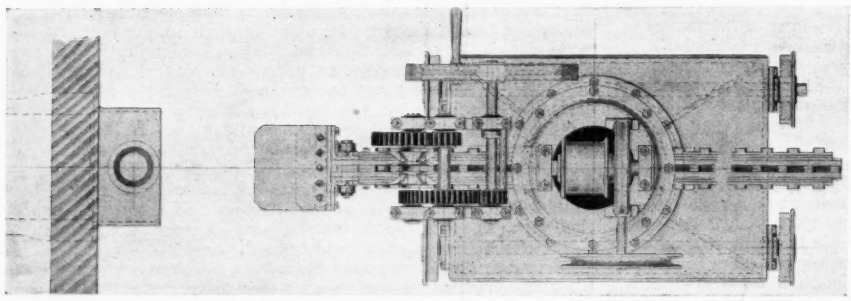
THE FIDDES (1896) RETORT DISCHARGING-RAM.



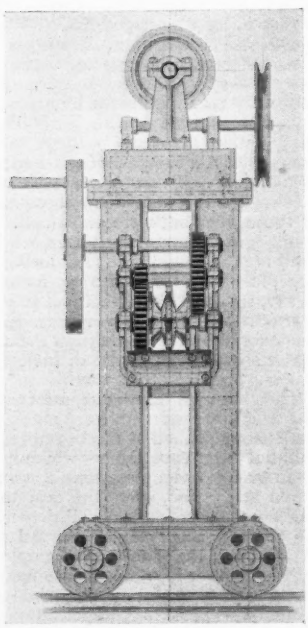
Side Elevation.



Cross Section.

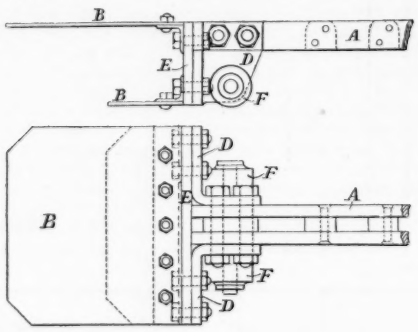


Plan.



Front View.

The ingenious methods that are now one after the other being devised for the purpose of performing an old operation—to wit, the pushing of spent charges from gas-retorts—are interesting; but, in their multiplicity, one is apt to forget former workers in the same direction. Among these was Mr. William Fiddes, of Bristol; and we have obtained from him a drawing showing his manual discharging-ram of some nine years or so ago. This ram, Mr. Fiddes tells us, he used in 1895 with complete success. By it, two men ejected 7 cwt. charges from 20 feet ⌂ retorts in



about 30 seconds. Practically no breeze was made, and at no time was there a case of coke heaping in the retorts. One advantage of the arrangement was that, when not in use, the ram could be swung round out of the way; thus preventing any obstruction in the retort-house. Hence single telescoping was all that was necessary. The machine worked in this way: The first part of the ram, with its ram-head, was racked out half way into the retort, when it automatically interlocked with the second portion of the ram, which it brought forward until the teeth for the driving-wheel engaged with those on the outside bars. The whole then journeyed forward, until the head reached the furthermost mouthpiece of the retort. The reverse motion of the gear brought the whole backwards, unlocking the two parts of the ram, and allowing the inner portion to come to its original position. The reason for the disuse of the machine was explained in the "Journal" for Sept. 8, 1903, in the article that described the Fiddes-Aldridge combination discharging and charging machine.

In the "Journal" for May 26, 1896, there appeared the following abstract of Mr. Fiddes's patent specification (No. 10,697, May 30, 1895): This retort-discharging apparatus consists of plates of metal set fast on the end of a ram for propelling the coke from through gas-retorts. The apparatus is arranged in any suitable manner, so that it can be brought in front of the mouthpieces of the retorts. A is the end of the ram, which receives reciprocating motion to travel the end of it through a retort, and to withdraw it therefrom. B are specially constructed plates; the uppermost one being longer than the lower one. The plates are secured to the ram by angle-irons and wing-plates D and the cross-plate E. Rollers F, attached to the wing-plates, prevent any scraping action upon the bottom of the retorts. The plates B are of suitable width for the size of the retorts; and they pass above and beneath the near end of the coke lying within the retort. Upon the forward movement of the ram, the plates protect the coke from being crushed or from heaping; and, "by the protective action thus secured," the forward motion of the ram is imparted to the mass of the coke.

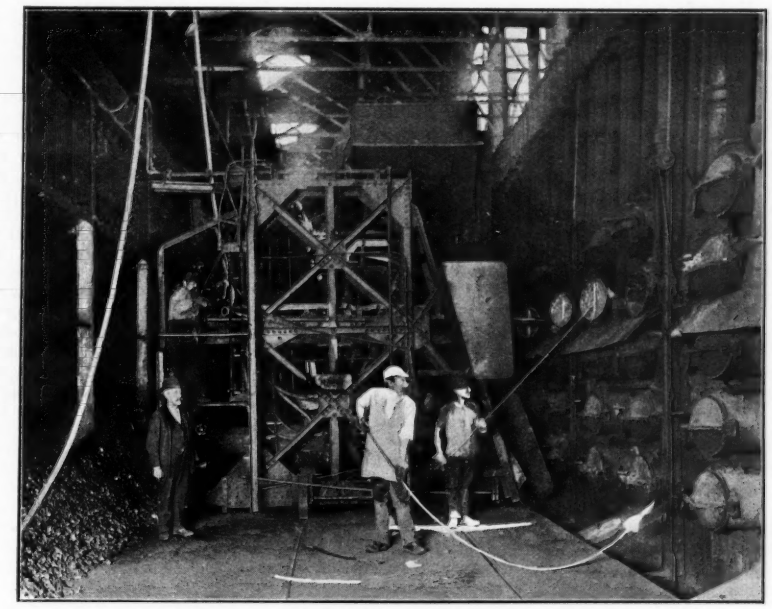
THE NEW "CO-PARTNER" COKE DISCHARGER.

By W. A. Barnett.

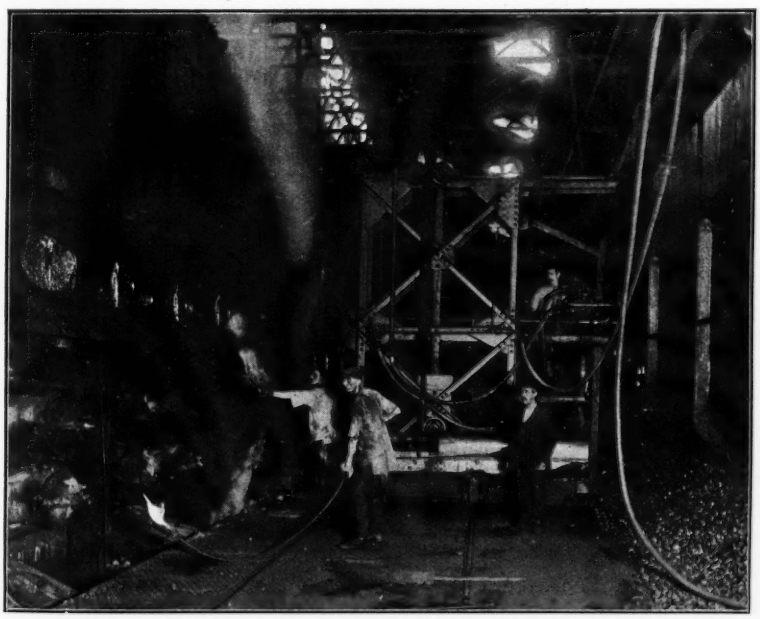
[Reprinted from the "Co-Partnership Journal" of the South Metropolitan Gas Company.]

The machine devised and built at Rotherhithe for discharging the coke from gas-retorts by hydraulic power, after extended use, has proved itself worthy of the above designation. It consists of telescopic rams and cylinders with telescopic drawback pressure pipes. It discharges the whole of the coke from the retort in one operation; the stroke of the rams being 24 feet—20 feet of retort, 3 feet for the two mouthpieces, and 1 foot clearance for the door and lever on the machine side to clear the pusher-head.

The rams consist of, first, a $2\frac{1}{2}$-inch outer diameter steel tube $\frac{3}{8}$ in. thick, 15 ft. long, with a plug welded in the front end to fasten the pusher-head with a socket and cottered joint. On the other end are screwed packing-rings and nuts to tighten-up packing in position. These are $3\frac{1}{4}$ inch outer diameter, and give a long bearing of 17 inches inside the next tube, and act as the plunger-head to draw back the ram. Ram No. 2 is a steel tube 4 inches outer diameter, 3 inches inner diameter, screwed at both ends. The front end takes the steel stuffing-box of ram No. 1, and carries forged steel elbows screwed into it, to connect the telescopic pipes for the drawback to ram No. 1. The other end is screwed for packing-rings, $4\frac{3}{4}$ inches outer diameter, and 17 inches long, for the drawback of this ram. This tube also acts as the cylinder, inside of which ram No. 1 works. The respective strokes of these rams are 12 ft. $7\frac{3}{4}$ in. and 11 ft. 5 in., and the lengths of the tubes are 15 ft. $0\frac{1}{4}$ in. and 14 ft. $0\frac{5}{8}$ in. The larger cylinder is a steel tube, $5\frac{1}{2}$ in. outer diameter, $4\frac{3}{4}$ in. inner diameter, and 12 ft. 10 in. long, encased in three iron castings—the one at front carrying steel tees with inlets for the drawback of the 4-inch ram, and also its stuffing-box and gland. The casting at the back end carries the gun-metal valve for actuating the rams, also the steel tees to support the 2-inch hydraulic tubes, which act as cylinders to the steel telescopic drawback pipes. These castings have each two feet, which are bolted to a 6 in. by 5 in. by 25 lb. steel joist to give rigidity to the cylinder; and this joist also carries a swivel thrust-block about the centre of its length, to withstand the thrust of the machine when discharging coke. The central casting is split at the top and is clamped to the $5\frac{1}{2}$-inch diameter tube to keep it in position, and also bolted to the joist. The back casting has a removable cover for giving access to the internal packing for examination, and for withdrawing the rams when necessary. The inlet for the pressure to drive forward the rams is also cored in this cover. The three castings are chambered and bored at each end to fit the $5\frac{1}{2}$-inch tube forming the large cylinder. The telescopic pipes for the drawback are of steel, $1\frac{3}{8}$ inch outer diameter, 1 inch inner diameter, and they pass through the steel tees, forming inlets to the drawback of the large ram, which are screwed to the cast-iron cylinder casings before mentioned, and act as stuffing-boxes to the drawback of the 4-inch ram and the $2\frac{1}{2}$-inch ram. These tees are screwed to 2-inch hydraulic barrel carrying the water supply for the drawbacks of both rams. All the threads are screwed to gas standards. The tubes are of solid hot-drawn steel, and all fittings are of forged steel machined from the solid.



Pushing the Coke through the Retort



The Coke Falling from the Retort.

The water for actuating the machine is conveyed to the valve by flexible armoured hose, with swivel-box fittings of gun-metal, and passes through the valve to pipes—first to the discharging-rams by a $1\frac{1}{2}$-inch inner diameter copper pipe with forged steel snugs bolted to the valve and back cover; secondly to the drawback side of the plungers through two 1-inch inner diameter copper pipes fitted with gun-metal unions, and connected to the valve with a forged steel Y fitting and steel nipples to the tees. The exhaust water is carried from the valve to the top of the machine by flexible hose, and thence by a 2-inch pipe to troughing and pipes carrying it to the tanks supplying the hydraulic pumps. The valve, of substantial though simple construction, is gun-metal, and actuated by a self-contained plunger 3 inches diameter, governed by a circular disc valve, which is controlled by a balanced butterfly key, and is easily moved by a touch of the finger and thumb; one quarter revolution each way discharging the coke, and returning the rams into position for the next retort—the whole time taken being 20 seconds.

The cylinder and rams hang in a frame of stiff construction built of steel angles and plates, mounted on four wheels in the usual manner. The axles run in iron brackets carrying gun-metal bearings renewable by simply lifting the frame. The frame and machine are driven along the stage rails by a hydraulic three-cylinder engine with reversing-valve, self-contained, and connected to the axle by a bevel wheel and pinion.

The beam proper is lifted to the several tiers of retorts by a hydraulic ram and cylinder, chains from which are carried over guide-pulleys at the bottom and top of the machine frame, and fastened to the cylinder and joist simply by means of clips bolted to them.

The Price of Thorium Nitrate.—According to a letter addressed by Messrs. Oberfelt and Co., of Berlin, to the "Ironmonger," the price of thorium nitrate, which was about 42s. 3d. per kilogramme in July, has risen to the equivalent of about 52s.

OBITUARY.

The death occurred a few days ago of Mr. JOHN GRISENTHWAITE, the Superintendent of Meter Inspectors of the Liverpool United Gas Company. Deceased had a large share in the introduction of penny-in-the-slot gas-meters. He was 63 years of age.

The death of Mr. THOMAS HOLCROFT, J.P., took place at his residence in Wolverhampton on the 25th ult. Deceased, who was eighty years of age, was for some time Chairman of the Bilston Gas Company and a Director of the Willenhall Gas Company, and also assisted materially in obtaining a supply of water for Bilston. Mr. Holcroft was for many years associated with the South Staffordshire iron trade.

We regret to record the death, in his 82nd year, under painful circumstances, of Sir RICHARD HENRY WYATT, one of the Directors of the Brentford Gas Company, and a member of the Board of the Southwark and Vauxhall Water Company, recently merged in the Metropolitan Water Board. Deceased was staying at his home at Broadstairs in August, when he accidentally overturned a lamp and set fire to his night clothes. To the injuries sustained, he succumbed last Wednesday. At the Coroner's inquiry the next day, medical evidence was given that Sir Richard's constitution was breaking up, and that the burns had accelerated his death. Deceased, who was the son of the late Mr. Charles Wyatt, was knighted in 1883 for his public services.

PERSONAL.

We learn that Mr. J. R. MACKENZIE, formerly Gas Manager to the New Mills Urban District Council, has obtained a similar position under the Marple District Council. He is a brother of the late Mr. W. Mackenzie, of Cupar and Dunfermline.

At a social gathering of employees of the Liverpool United Gas Company, at which the Engineer (Mr. Edward Allen) and the Superintendent (Mr. M. C. Telfer) were present, Mr. J. H. BEETSON, the Deputy-Superintendent, was presented with several gifts on the occasion of his retirement from the Company's service.

In commemoration of the silver wedding of Mr. W. J. STURGES, the Secretary of the Gas Department of the Smethwick Corporation, the office staff, collectors, and inspectors recently made a joint presentation, in the form of a silver filigreed spirit decanter, to him and Mrs. Sturges. Both recipients acknowledged the gift, stating that, not only for its intrinsic value, but also for its embodiment of good wishes, it would find a place among their most treasured possessions.

At the Ilford Gas-Works, on the 30th ult., an interesting ceremony took place in the governor-house, when Mr. Alex. A. Johnston, the Engineer and Manager, on behalf of the staff and employees, presented his Assistant (Mr. W. B. Farquhar) with a handsome marble clock and silver cigarette case, on the occasion of his marriage, Mr. Johnston wished long life and happiness to Mr. and Mrs. Farquhar, and testified to the general esteem and respect the former had gained on all sides since his appointment at Ilford. In an appropriate reply, Mr. Farquhar thanked Mr. Johnston for his kindness, and the subscribers most heartily for their handsome presents. He said he was sure his wife would prize their gift very highly. The proceedings closed with three hearty cheers for the bride.

The retirement, on the 30th ult., of Mr. J. R. DOWNES from the position of Engineer, Manager, and Secretary to the East Surrey Water Company was marked by a pleasant gathering, at the Company's Offices, Redhill, of the members of the staff and employees, together with some former members, which was made the occasion for a presentation to Mr. Downes, consisting of a silver inkstand and a handsome revolving chair. This testimonial was spontaneous and perfectly unanimous, and those present signified their great pleasure at being enabled to show their appreciation of Mr. Downes' unvarying kindness as an individual and ability as an official, and their deep regret at his departure. Mr. Cornewall-Walker (who succeeds Mr. Downes), in making the presentation, conveyed the good wishes of all for him, as well as for Mrs. Downes. Mr. Downes, in acknowledgment, said he was quite unprepared for so flattering a demonstration; and he expressed his hearty thanks for, and his pleasure in, accepting the very handsome and useful gifts, which he would prize as a continual reminder of the givers. He took the opportunity of thanking the staff for the assistance they had so loyally rendered him, and stated that it would always be a pleasure to him to hear of their future welfare and success. The gathering concluded with three hearty cheers for Mr. Downes, who, to the satisfaction of the entire staff, has been appointed "Consulting Director" of the Company. The inkstand bore the following inscription: "Presented, together with a chair, to James Rathbone Downes, Esq., on his retirement from the post of Engineer, Manager, and Secretary of the East Surrey Water Company, by the staff and employees, as a token of their sincere regard and esteem. 30th September, 1904."

A LARGE COAL-CONVEYING PLANT.

The "Engineer" describes and illustrates this week a large coal-conveying and ash-handling plant at the Manchester (Stuart Street) electric power station; the adoption of plant of the kind being a feature of the modern equipment of such stations. The installation includes two conveyors of the gravity-bucket type; each being 630 feet in length. The buckets are of the malleable cast seamless pattern, and measure 20 in. long by 17 in. wide. They are carried by two chains, which are fixed $23\frac{5}{8}$ in. apart, which leaves ample clearances at each end to permit of the buckets swinging quite freely. The capacity of each bucket is 1 cubic foot. They are spaced at 2 feet centres, so that there is a space of 4 in. between the edges of two adjacent buckets. The chains are made up of double steel links 3 in. wide by $\frac{3}{8}$ in. thick. The wheels or rollers are 5 inches in diameter, and are turned on the tread, which is $2\frac{1}{4}$ inches wide.

The coal is brought on to the site in ordinary railway trucks over a viaduct under which is situated the coal-hopper. At the bottoms of these coal-hoppers are doors fitted with double racks, pinions, worm gear, and hand-wheels, which regulate the flow of the coal into an automatic revolving filler. Into this the coal is led through the side, and escapes through holes in the periphery, which holes are slightly less in size than the mouth of the buckets. There is an arrangement of plates by which spilling of the coal is prevented. From this point the buckets travel in a trench, which is 8 ft. 9 in. below the floor-level, to the driving-wheels, which are nearly 4 feet in diameter, and revolve four times per minute, giving a speed of 48 feet per minute on the chains. The spur gearing is of steel, with machine-cut teeth; the last pair of wheels being $6\frac{1}{2}$ in. face, $2\frac{1}{2}$ in. pitch, and the first pair 4 in. face, 1 in. pitch. Each motor is designed to give 17-horse power at 650 revolutions when supplied with a direct current of 220 volts. The gear is entirely cased in. After passing round the driving-wheels, the chain curves back, and is guided round rails which end with a vertical line. Up this, the chain passes to a height of 42 feet above the boiler-house floor level. On reaching this height, they pass round corner wheels, which are 3 ft. 6 in. in diameter, and travel a distance of 66 ft. 6 in. to the wall of the boiler-house. In this length they pass over the viaduct, which has three lines of rails—two over the coal-hoppers, which are covered by a roof, and one under the ash-bunkers. Just before reaching the end wall of the boiler-house, the machine passes over a Denison automatic weighing-machine. Near this point also the chain goes over a tipper, which can be arranged to empty the buckets of ashes—these falling into the ash-hopper—when the conveyor is used for lifting the ashes. This, however, is only an alternative method of dealing with the ashes, which are, as a rule, lifted by the separate elevators provided for this purpose. In the boiler-house, the coal-conveyors are carried from the girders of the roof. They pass over the coal-hoppers, and the buckets may be tripped and emptied at any desired point. On reaching the end of the boiler-house, the conveyors take a turn round 4 feet diameter tension wheels, pass back and over a further set of corner wheels, on rounding which they descend in the lattice-braced framework to the trench already mentioned. The actual power required to drive the coal and ashes at the rate of 30 tons per hour is 20 ampères with a continuous current of 220 volts.

The conveyors, with the necessary structure, motor, gearing, and weighing-machines, were supplied and installed by the New Conveyor Company, Limited.

A Rand Water Arbitration.—Mr. H. W. Worsley Taylor, K.C., M.P., will shortly proceed to South Africa to preside over the arbitration which is to deal with the transfer of the undertakings of the Rand Water Companies to the Rand Water Board. The other members of the Court will be Mr. Richard Currie and Mr. W. L. Strange, Director of Irrigation in the Transvaal.

Transactions of the Societe Technique.—We have received the report of the proceedings at the 31st congress of the above-named Society, which was held in Paris from the 14th to the 17th of June. The principal papers brought before the members on this occasion were dealt with in the "JOURNAL" at the time; and therefore do not call for further notice. They are illustrated by a large number of plates. The volume contains, as usual, the lists of members, the rules of the Society, &c.; and M. Victor Delahaye continues his review of legal proceedings in connection with gas undertakings—for years a feature of these volumes.

Swiss Gas and Water Association.—The 36th annual meeting of this Association was held at Lausanne on the 24th and 25th of September. In addition to the general business, the following papers were submitted: "Analysis of Coals," by Herr A. Weiss, of Zurich; "Gas Lighting at the Federal Shooting-Range of St. Gall," by Herr H. Zollikofer, of St. Gall; "Water Supply by Dams," by Herr H. Peter, of Zurich; "Increasing the Industrial Efficiency of Producer Furnaces," by Dr. E. Ott, of Zurich; "The Gutknecht Method of Concentrating Ammoniacal Liquor," and "Locating Leakages in Water-Mains by the Deacon Meter," by Herr A. Utinger, of Zug. In the afternoon of the first day, a visit was paid to the Lausanne Gas-Works. The second day was devoted to an excursion on the Lake of Geneva; the party separating at Montreux.

SCOTTISH JUNIOR GAS ASSOCIATION—WESTERN DISTRICT.

ANNUAL MEETING ON SATURDAY.

The First Annual Meeting of the Scottish Junior Gas Association (Western District) was held on Saturday evening in the Technical College, Bath Street, Glasgow. There was an attendance of over a hundred. Mr. JAMES LOWE, the Assistant General Manager of the Glasgow Corporation Gas Department, the President for the year, occupied the chair.

In terms of the rules, it fell to the meeting to elect two Auditors, and Messrs. John Smith and James Mann, both of Glasgow, were unanimously chosen for the office.

INAUGURAL ADDRESS.

The PRESIDENT then proceeded to deliver his presidential address, as follows:—

Gentlemen—The recent events which have led to the formation of this Association are fresh in your minds, and it is unnecessary for me to recount them. The Association has sprung into existence as a result of a movement which originated some years ago, when the Manchester and District Junior Gas Association was formed. Since then, various similar Societies have been started; and of these, this—the Scottish Junior Gas Association, Western District—is the latest. It is unnecessary at this stage to give reasons for our corporate existence. Such justification as this Association requires must be found in its usefulness to its members, in the opportunities which it offers for the improvement of our technical knowledge, and in the facilities for exchange of ideas which it affords to those engaged in the diverse branches of the same industries.

I appreciate very highly the honour which you have conferred upon me in electing me to be your President during the ensuing year; and I look forward to my term of office with pleasure and with great expectations of benefit from our discussions. One of the duties which pertains to the office of President is the making of an Opening Address. In the senior Associations, this address is often (and rightly) of a highly technical nature; but it seems to me sufficient, at least in this the inaugural year of our Association, to take a less exalted flight. Especially does this course commend itself after a consideration of the syllabus of papers for the coming session. As you are aware, the subjects which will be dealt with in detail are both numerous and varied; and in view of this, the remarks which I have to offer will be found of a more general and introductory character. The requirements of the occasion may perhaps be met by a brief consideration of the position and prospects of the industry in which we are, or hope to be, engaged. Is this industry possessed of the elements of stability and permanence in view of the increasing competition to which it is subjected?

NATIONAL ECONOMY.

First of all it may be worth while glancing at the matter from the point of view of national economy. The importance of the gas industry in affording an economical means of utilizing coal cannot be urged too insistently in the present extravagant age. The rate at which our stock of coal is now being diminished is 220 million tons per annum, and is increasing. Many and differing computations have been made regarding the life of the coalfields; but no doubt at all exists that a time will eventually come when these will be exhausted. That the welfare of the nation is closely bound up with the future of the coalfields must be evident to all; for from this mineral is derived the energy, whether it be applied by steam, gas, or electricity, which drives mills, propels ships, locomotives, and tram cars, lights and heats cities, and does the one thousand and one things which make life as we know it possible. Other sources of power in Nature exist, such as waterfalls, winds, &c.; but none other is of so much practical importance—at least, in this country, although other lands, notably the United States of America and Switzerland, are more favourably situated with regard to water power.

Energy is obtained from coal chiefly by means of the steam-engine, the gas-engine with coal gas, or the gas-engine with producer gas. The steam-engine, considered as a heat engine, is most uneconomical. Probably the average thermal efficiency of all steam-driven plants in operation will not exceed 4 per cent. Of course, this figure is greatly exceeded in well-equipped central stations, such as those for the supply of electricity. Such stations will probably have a fuel consumption of about 4 lbs. of coal per Board of Trade unit sold—that is to say, they will probably convert about 8 per cent. of the heat of the coal into electric energy at the switch-board, and that is all. There are no residuals of any kind; the remainder is lost—part having gone down the exhaust pipe, and part up the chimney to pollute the atmosphere. In the case of an electricity supply company, probably not more than about 7 per cent. of the energy of the coal will be delivered as current to the consumer.

How different is the result where energy is obtained from coal by either of the other methods. In the manufacture of coal gas, about 20 per cent. of the heat of the coal may be obtained as gas, about 47 per cent. as coke, and, in addition, the crude residual products obtained have a value of (at present) from 3s. to 4s. per ton of coal, according to market fluctuations. Indeed, carbonization in closed chambers, such as gas-retorts or coke-ovens, with recovery of bye-products, is a most economical process. The gas may be distributed in mains with very small loss; and if it be used for power purposes in a gas-engine, 25 per cent. of its heat may be converted into useful work.

With the gas-producer, about 80 per cent. of the heat of the coal may be converted into a combustible gas, and 25 per cent. of this may be converted into brake-horse-power in a gas-engine. There are no bye-products which may be recovered except sulphate of ammonia; practically the whole of the carbon being gasified.

It will thus be seen that, so far as economy in fuel is concerned, the steam-driven plant is quite outclassed. In evidence given before the Royal Commission on Coal Supplies, Mr. Beilby estimates that if the average steam-engine were entirely superseded, the 52 million tons of coal used annually for power purposes would be reduced to 11 million tons. From this it will be seen that, considered solely from the point of view of national economy in coal, the gas industry deserves well of the community by affording an economical means of utilizing coal.

POWER.

We shall now glance briefly at the cost of the rival systems for the supply of power, light, and heat. With a supply of coal gas having a calorific value of from 600 to 650 B.T.U. per cubic foot, for all round economy there is nothing to touch the gas-engine for powers up to 50 brake-horse-power. For higher powers than this, the steam-engine becomes a formidable rival; but the balance of advantages may still rest with the gas-engine for powers up to 100 brake-horse-power, since the plant is more compact, and does not require boiler or chimney, coal-store, ash heap, and fireman—especially is this so if it be required to run intermittently. The cost of running a gas-engine of 10 brake-horse-power for a year of 2500 working hours may be taken at £57 1s. (see Appendix "A"); while that for running a steam-engine of the same power for the same time is estimated at £92 10s. (see Appendix "B").

For large power installations, gas-producer plants, either with or without the recovery of bye-products, are without doubt the most economical, and are beginning to supersede steam-engine and boiler installations. These are, however, not suitable for small powers, and therefore do not enter into competition with gas-engines using town gas. In fact, their advent for large powers should be beneficial rather than otherwise to the coal-gas industry, as the enormous saving in fuel which would be secured by their general adoption would tend to reduce the price of coal. The new suction-gas producer with engine forms a slightly more serious rival to coal gas for the generation of small powers. These "suction" plants are still in the experimental stage, and very little reliable information as to their working can be obtained. Trouble will probably arise from the variable quality of the gas produced, which is poor in hydrogen, and necessitates a larger engine provided with a costly sparking arrangement. There will probably also be some risk of obtaining an explosive mixture in the generator and scrubber when the engine is being started. There is also the inconvenience of storing anthracite or coke, and of disposing of the ashes; but the worst feature of all is the danger of converting the engine-house into a lethal chamber by the escape of the deadly producer gas, whose presence cannot be detected by smell. Everything considered, there does not seem to be a field for "suction" plants where there is a cheap supply of coal gas. An estimated annual cost for gas-engines with suction producers is given in Appendix "C."

Probably the greatest rival of the gas-engine for the production of power is the electric motor supplied by current from a central station. This is a little surprising when one considers the relative costs of the systems. In considering the cost of energy by the electric motor, the price of current has been assumed to be 1d. a unit; and the efficiency of the motor is taken at about 83 per cent. With these assumptions, which are altogether favourable to electricity, the cost for a 10 brake-horse-power motor per year of 2500 hours would be £98 14s. (see Appendix "D").

Since electric power, even on this basis, costs twice as much as gas power, one naturally looks for compensating advantages; but usually in vain. For the driving of ventilating fans, electric elevators, and a few other purposes, electricity is well adapted; but in the vast majority of cases, power could be more advantageously and cheaply obtained by gas-engines.

LIGHT.

The only competitor of coal gas for lighting purposes which need be considered is electricity. When the advent of electric light took place, it was said by some that gas would soon be superseded by the new illuminant. But gas has managed to survive, and not only to survive but to prosper exceedingly; and it is noteworthy that in Glasgow, and probably in many other places, its consumption was nearly doubled during the last decade of the Nineteenth Century, when electricity may be said to have arrived. The invention of the incandescent mantle has greatly

strengthened the position of gas for illuminating purposes. A comparison of the relative costs of gas and electric light will show whether there be any present danger of gas being superseded. With gas of 20-candle power at 2s. 1d. per 1000 cubic feet (Glasgow rate), 20s. will pay for 9600 cubic feet, which, if burned at the 5 cubic feet rate, would give a light of 384-candle power for 100 hours; if burned by ordinary incandescent burners, this quantity of gas would give a light of 1920-candle power for 100 hours; and if intensified incandescent burners be employed, the power of the light given would be 3840 candles for the same time.

The electric incandescent lamp uses 4 watts per candle hour. Some difficulty is experienced in choosing the rate per unit to be taken, on account of the differential rates in use. The price in Glasgow for domestic consumers is 3½d. per unit, for churches 3d., and for premises other than those already mentioned 6d. for the first 365 hours use per annum of the maximum demand, and for all current consumed over this quantity 1d. per unit. For the purposes of comparison, we shall take a flat rate of 3d. per unit. Twenty shillings will thus pay for 80 units, and will yield by electric incandescent lamps a light of 200 candles for 100 hours. If the so-called 2000-candle power arc lamp, giving a light of about 850-candle power and consuming about ¾ unit per hour, be used, 20s. will purchase a light of about 900-candle power for 100 hours, or about a quarter of the light which may be had by intensified incandescent gas for the same money.

Proprietors of establishments who desire electricity for lighting, and who require much current, would do well to consider the advisability of a private gas-engine driven installation of their own. With gas at 2s. per 1000 cubic feet, current could be generated at about 0·6d. to 0·7d. per unit.

The vitiation of the air in gas-lit rooms is a favourite theme with advocates of electricity for lighting, and too much is constantly made of this point. One incandescent mantle of 50-candle power will illuminate a room whose cubical contents are over 3000 cubic feet, and the products of combustion per hour will not exceed 20 cubic feet, or about ⅔ per cent. of the contents of the room. When it is remembered that the burning of gas promotes ventilation, it will be realized that this objection is not well founded. If sufficient ventilation be provided to keep a room fresh when occupied in the day time, the use of gas for lighting will not detrimentally affect the condition of the air. Indeed, I remember having seen the results of a test showing that the air of a room which was occupied during the day actually became purer after the gas was lit, due to improved ventilation. Another objection frequently urged against the use of gas is the evil effects of the sulphur compounds from the products of combustion. This subject has recently been investigated with scientific precision and completeness by Mr. Otto Hehner and Dr. Samuel Rideal. The results of their experiments were laid before the Committee on Metropolitan Gas Testing on the 15th of March last.

Two sentences from their report may be quoted: "Under ordinary conditions, we have found not only no increase in the sulphur contents of the air of (gas lighted) rooms over that of the outside air, but we have even found a decrease, owing to the rapid purification by the walls and the ceiling;" and "Experiments on the tarnishing of metals have shown that a greater effect was produced by exposure to the outside town air than to the air of the room in which gas was burning." In the absence of any scientific evidence of a conflicting nature, these results must be accepted as true.

Heat.

In his evidence before the Royal Commission previously referred to, Mr. Beilby estimates that 36 million tons of coal are used annually for the production of heat for domestic purposes, and he also states that economy may be hoped for from the increasing use of gas-stoves and gas-fires. The utility and convenience of the gas-stove is its sufficient recommendation, and it is certain to become increasingly popular. The position of the gas-fire is not so strong. The chief reason which prevents its more general adoption is that it is not so cheap as a coal-fire. It has, however, the advantages of cleanliness and lessened labour; and its use tends to mitigate the smoke nuisance in cities. There is, however, room for improvement and invention in order to employ usefully a greater proportion of the heat developed.

The gas industry is still in its youth; and one cannot doubt that it is destined to play a greater part in the future than it has ever done in the past. There is room for great expansion in its applications for the production of power and heat; while there seems no reason why it should not maintain the position which it holds as an illuminant. The prevailing tendency seems to favour the supply of gas containing fewer hydrocarbons of the ethylene (C_nH_{2n}) series. Such gas is universally, but erroneously, referred to as gas of a lower candle power. When burned under modern conditions, the illuminating power is not decreased. The economies which may be effected by the manufacture of such a gas would enable it to be sold cheaper; thus promoting its consumption for power and heat purposes. The day consumption would thus be increased and the cost of distribution per 1000 cubic feet diminished, so that a further reduction in price would follow. The direction of progress undoubtedly lies in the cultivation of a day consumption; and many undertakings could build up a business which would be immediately profitable by encouraging this consumption by a substantial discount.

The distribution of producer gas has been suggested for power and heat purposes. The calorific power of this gas is less than a quarter that of coal gas; so that it would have to be sold at less than 6d. per 1000 cubic feet to compete with coal gas at 2s. The cost of distribution will probably never allow this to be done. It might, however, be delivered in bulk to power stations. If this were done to an electric station, the fuel cost per unit generated would be decreased; but the fuel cost at present forms only a small part of the total cost—in some cases less than a ½d. per unit generated—so that the price of current would scarcely be affected.

Probably much of the progress in the applications of gas which has been made, is due to the competition to which the industry has been subjected. While beneficial to some extent, the rivalry has also been somewhat unscrupulous and unfair. Fictitious statement or bald assertion that electricity is best for all purposes has often secured business. The public is easily duped, it culls its technical information from periodical literature, such as "Tit-Bits" or the "Strand Magazine." It loves romance, and the mysteries of electricity, liquid air, or radium far outweigh the charms of prosaic gas. Disenchantment comes when it discovers that the most mysterious thing about electricity is the bill. The cause of gas is to some extent suffering from the modesty which pervades the gas engineering profession. The public mind requires to be educated; and I hope that the influence of the members of this Association will yet make itself felt.

Our first duty in this respect is, however, due to ourselves. The general question of the training of Engineers has of late received great attention in the Technical Press; and the particular question of the best training for the gas profession receives some attention annually. In an Association such as this, whose members are drawn without restriction from all branches of the gas manufacturing and kindred industries, it would be idle to put forth a scheme as applicable alike to all. Many of our members will doubtless avail themselves of the Gas Manufacture classes about to be started in this College under Mr. Henry O'Connor. These classes, in conjunction with this Association, will be of great benefit, but will not by any means contain all that might be included in the education for the gas profession. The engineer and chemist have to be trained; and this training should be on as broad a basis as possible. It is a mistake to specialize too soon. It seems to me easier for the engineer to acquire a knowledge of chemistry than for the chemist to become an engineer; and for this reason a preliminary training, both practical and theoretical, as a mechanical engineer, is desirable.

To members who are at present being trained with the intention of entering the gas engineering profession, I would commend the courses of study in engineering (mechanical, civil, and electrical) and chemistry to be found in the prospectus of this College.

Appendix "A."

Estimated Cost per Annum (2500 *working hours*) *of Power Generated by Gas-Engines using Town Gas of Calorific Value* = 650 *B.T.U., Costing* 2s. *per* 1000 *Cubic Feet.*

Gas consumption taken at 16 cubic feet per brake-horse-power hour.

Engine of 10 brake-horse-power, costing about £65.

	£	s.	d.
Interest and depreciation at 7 per cent.	4	11	0
Gas per annum 400,000 cubic feet	40	0	0
Attendance, 10 hrs. per week at 6d.	12	10	0
Annual cost	57	1	0

Engine of 25 brake-horse-power, costing about £130.

	£	s.	d.
Interest and depreciation at 7 per cent.	9	2	0
Gas per annum 1,000,000 cubic feet	100	0	0
Attendance, 10 hrs. per week at 6d.	12	10	0
Annual cost	121	12	0

Engine developing 50 brake-horse-power, costing about £225.

	£	s.	d.
Interest and depreciation at 7 per cent.	15	15	0
Gas per annum 2,000,000 cubic feet	200	0	0
Attendance, 15 hrs. per week at 6d.	18	15	0
Annual cost	234	10	0

Engine of 100 brake-horse-power, costing about £400.

	£	s.	d.
Interest and depreciation at 7 per cent.	28	0	0
Gas per annum 4,000,000 cubic feet	400	0	0
Attendance, 15 hrs. per week at 6d.	18	15	0
Annual cost	446	15	0

Appendix "B."

Estimated Cost per Annum (2500 *working hours*) *of Power Generated by Non-Condensing Steam-Engines.*

Steam-engine of 10 brake-horse-power, with vertical boiler, &c. Cost of engine and boiler (say) £100.

	£	s.	d.
Interest and depreciation at 7 per cent.	7	0	0
Coal per annum (6 lbs. per brake-horse-power), 67 tons, at 10s.	33	10	0
Attendant's wages, 20s. a week.	52	0	0
Annual cost	92	10	0

Steam-Engine and Vertical Boiler of 25 brake-horse-power, costing (say) £150.

	£	s.	d.
Interest and depreciation at 7 per cent.	10	10	0
Coal per annum (5 lbs. per brake-horse-power), 140 tons, at 10s.	70	0	0
Attendant's wages, 25s. a week.	65	0	0
Annual cost	145	10	0

Steam-Engine, with Cornish Boiler, of 50 brake-horse-power, costing (say) £300.

Interest and depreciation at 7 per cent.	£21	0	0
Coal per annum (4 lbs. per brake-horse-power), 223 tons, at 10s.	111	10	0
Attendant's wages, 30s. a week.	78	0	0
Annual cost	£210	10	0

Steam-Engine with Boiler, 100 brake-horse-power, costing (say) £600.

Interest and depreciation at 7 per cent.	£42	0	0
Coal per annum (4 lbs. per brake-horse-power), 446 tons, at 10s.	223	0	0
Attendant's wages, 30s. a week.	78	0	0
Annual cost	£343	0	0

In addition to the amounts charged above, there is the cost of water, removal of ashes, boiler cleaning and insurance, and greater space occupied, also capital expenditure on chimney and boiler setting; so that there will be little difference in cost between steam and gas engines at 100 B.H.P.

Appendix "C."

Estimated Cost per Annum (2500 working hours) of Gas-Engines and Suction Producer Plants.

Fuel used, anthracite peas at 20s. a ton.

1 lb. required per brake-horse-power hour.

Suction-producer Plant to Develop 10 brake-horse-power.

* Cost of gas-engine (say) £105.
Cost of producer (say) £100.

Annual costs.			
Interest and depreciation—			
{ 7 per cent. on £105	£7	7	0
{ 10 per cent. on £100	10	0	0
Cost of fuel.	11	3	3
Attendance, 20s. a week.	52	0	0
Annual cost	£80	10	3

Suction-producer Plant to Develop 25 brake-horse-power.

Cost of engine (say) £190.
Cost of producer (say) £130.

Annual costs.			
Interest and depreciation—			
{ 7 per cent. on £190	£13	6	0
{ 10 per cent. on £130	13	0	0
Cost of Fuel	27	18	1
Attendance, 25s. a week.	65	0	0
	£119	4	1

* Gas-engines using producer gas must be larger than those using coal gas for the same power, and must be provided with an electric sparking arrangement; also the plant occupies more space, and requires the services of an attendant to feed and clinker the producer.

If the engine is not required to run continuously, the relative economy is greatly reduced, due to stand-by losses or lighting up if the fire is allowed to go out.

Appendix "D."

Estimated Cost per Annum (2500 working hours) of Power Generated by Electric-Motors.

[The cost of electromotors varies considerably for the same output; being less for a high speed and high voltage and greater for low speed and low voltage. The costs taken below are for moderate speeds.]

Electromotor of 10 brake-horse-power. Cost (say) £60.

Interest and depreciation at 7 per cent.	£4	4	0
Current at 1d. per unit	94	10	0
Annual cost	£98	14	0

Electromotor of 25 brake-horse-power. Cost (say) £110.

Interest and depreciation at 7 per cent.	£7	14	0
Current at 1d. per unit	236	5	0
Annual cost	£243	19	0

Electromotor of 50 brake-horse-power. Cost (say) £150.

Interest and depreciation at 7 per cent.	£10	10	0
Current at 1d. per unit	472	10	0
Annual cost	£483	0	0

Electromotor of 100 brake-horse-power. Cost (say) £250.

Interest and depreciation at 7 per cent.	£17	10	0
Current at 1d. per unit	945	0	0
Annual cost	£962	10	0

On the motion of Mr. J. M'Creakie, of the Provan Gas-Works, the President was thanked for his address.

Mr. A. Smith, the Manager of the Tradeston Gas-Works, Glasgow, then read the following paper:—

NOTES ON GAS-WORKS CONSTRUCTION.

Gentlemen,—When asked by your President to contribute a paper to the first year's proceedings of the Western District of the Scottish Junior Gas Association, I felt rather diffident about promising to do so; but he overcame my scruples, so I have prepared some notes on gas-works construction. I would crave your indulgence if the remarks are a little rambling; for the subject is a large one. Having had some experience in connection with the necessary extensions and reconstruction of existing gas-works, as well as in the designing and constructing of entirely new works, the following notes are mostly the outcome of my own observations; so I trust that they may be both profitable and interesting to the younger members of the Association. I should like to preface my remarks by stating that they refer to large or medium sized works. However, I feel sure that, in a great measure, many of the points are equally applicable to the smaller gas-works.

Site.—In selecting ground for a new gas-works, the constructing engineer has certain general principles which he keeps in view. Some of these are: (1) The site to be acquired should be as nearly as possible at the lowest part of the district to be supplied, so as to get the advantage of the natural increase of gas pressure in reaching the higher parts. (2) The works should be in close proximity to a navigable river or canal, and with branch lines connecting to one or more railway systems; also with proper communication by road or roads with a main thoroughfare—all for the chief purpose of receiving and dispatching the various materials, such as coal, bricks, retorts, coke, lime, ashes, &c. (3) Consideration should be had that there are no undeground mineral workings on the site, as subsidences might occur to the buildings or plant. More particularly do I refer to the gasholders and tanks. Such a thing might prove very disastrous. (4) An easy way of providing both a high and low level, with communication by railway and road between them, so as to allow of interchange of traffic, should be arranged.

The price to be paid for the ground is a very important factor; and the general arrangement of the buildings, plant, &c., must, of course, depend very much upon the contour of the ground acquired. The engineer, having secured a site of sufficient area to allow of future extensions depending on the probable growth and increase in gas consumption, sets about getting a number of sections and levels of the ground plotted on drawings.

General Arrangement.—On a plan, with the levels marked thereon, a trial arrangement of the proposed positions of the various buildings, apparatus, railway sidings, connections, &c., should be put down, after which it is very necessary to have a number of bores made in various places—say, on the line of heavy walls, chimney foundations, and over the site of the gasholder and other tanks. Having determined approximately what the substrata and soil consist of, the engineer can then proceed with his general and detailed drawings, specifications, and schedules of quantities for the various contracts.

In planning a gas-works, one has to see that as much of the work—which is both arduous and exhausting—is done by machinery; and therefore the various buildings and plant should be designed to embody and utilize the most modern forms of machinery and labour-saving appliances for the manufacture of gas. Everything should be arranged so as to preclude as much as possible in the future the tearing down and clearing away of existing work to make room for extensions. In large gas-works, the buildings and plant are usually put down in units or sections, each forming a complete gas-works in itself, and so arranged that they can be worked either separately or in conjunction, or that the gas can be led from any one section to another. The whole of the scheme should be carried out with a thoroughness of workmanship, only the best materials being employed; and as simple a mechanism about all the apparatus as possible ought to be used. The buildings should not be put down too close to each other. For instance, the purifying-shed should be removed a considerable distance from the retort-house and coke-yard, so as to avoid all risk of fire. In fixing the levels throughout the works, the engineer endeavours to make the material excavated sufficient for embanking or levelling-up any hollows, so as to save the expense of removing the surplus materials from the site. In some instances clay has been found, and bricks have been made from it and used in the construction of the buildings and tanks—thus saving the cost of removing it and the bringing of the bricks, &c., into the works.

Drains.—One of the first things to be done, is to arrange the drainage system; and provided there is a main sewer near, its position and depth will in a measure fix the levels, and these should be so determined that sufficient fall is given to the drain-pipes from the bottom of furnaces and flues in the retort-house and the pits or chambers in connection with the coal breaking, conveying, and elevating machinery. Connections should be made with an acute angle in the direction of the flow of the sewage in the main sewer, and be as high as possible to prevent flooding, otherwise, in times of heavy rainfall, the carrying capacity of the sewer might be severely taxed, and much inconvenience caused thereby.

Pipes conveying hot water or liquor—say, from the blow-off cocks of steam-boilers, drain-cocks, and steam-traps, &c.—should be of cast iron, glass enamelled on the inside, and provided with flange joints securely bolted together. Pipes for taking away surface and rain water should be of fire-clay, highly glazed and vitrified, having spigot and faucet joints; the jointing material consisting of portland cement with a strand or two of gaskin previously inserted in the joint. The greatest care should be taken and inspection made while drain-pipes are being laid, for too often this portion of the work is done by persons wholly unaccustomed to it, and this frequently causes much annoyance, and inconvenience afterwards.

The trench for drains should be carefully dug and taken out as nearly as possible to a uniform grade, so as to dispense with packing, which sometimes is not very well rammed under and

around the pipes. Large cesspools, properly trapped and covered, should be built on the line of the main drains; also inspection eyes and manholes provided at convenient intervals. The cesspools are for collecting and intercepting the fine coke and ash dust (so much of which is always in evidence about a gas-works), and they should be cleaned out periodically.

During the progress of laying out, building new, or reconstructing gas-works, and more particularly when the drains are being laid (as they very often are) at a greater depth than other pipes, it is of the utmost importance that dimensions should be accurately taken as to the size, position, and levels of all pipes, including drain, gas, water, steam, and others, and this information, together with the positions of all valves, syphons, cocks, cesspools, and hydrants, put on drawings. At any time, and especially in a case of urgency, this information would be found most useful.

Water Supply.—Another point most essential is an efficient supply of water. In a large works, if possible, have two supplies from different sections of the district distributing street mains, so as not to be entirely dependent on one source. If water be found on the site, a well should be sunk, or water may be obtained from a river or canal. Either would be quite suitable for the purpose of quenching the coke, slaking the lime, or for use over the condensers. Reservoirs or overhead tanks are sometimes constructed; but this means considerable expense, though the advantages to be gained by possessing such "stand-bys" often outweigh the cost of same.

Roads and Railways.—The excavations for roads should be taken out so as to allow of a depth of at least 15 inches for the formation of macadamized roads. After the drain and other pipes have been put in, and the trenches thoroughly rammed with soil, large hand-set hard stones, placed on edge as closely as possible, and about 9 inches in depth, should be put down to form the bottoming; and over this small stones or gravel should be laid to completely fill up the spaces. On top of this, two equal layers of best whinstone metal should be spread; the lower layer consisting of pieces not larger than 2 inches cube, and the top layer 1½ inches cube, all thoroughly and properly cleaned. These two layers together should measure at least 6 inches, after having been rolled. The layers should be rolled in a dry state separately, with a heavy steam-roller. The finishing coat forming the surface of the road should consist of ½ inch whin blinding, well watered and rolled carefully, until the whole depth is thoroughly consolidated. For causewayed roads, a layer of concrete 6 inches thick should be laid, on top of which there should be a bed of sand about 1 inch thick, and finished with square dressed whin or granite setts 7 inches by 4 inches, properly grouted with two to one of portland cement.

Railways.—Sidings of ample accommodation should be provided inside the works, if possible, for the coal as it is received from the pits, and also for other materials required in gas manufacture. These sidings should be arranged with crossovers to allow of any particular waggon being easily withdrawn if required. Space should be found for marshalling the waggons so as to get the proper mixture of coals desired to put into the store for delivery to the breakers, &c. Coal and lime might be brought in on a high level, and coke, ashes, &c., sent out from the low level. A matter which adds greatly to increased economy in working, but which cannot always be obtained, is to have the loaded waggons of coal received at one part of the works, weighed, and passed on, emptied and sent forward, weighed, and loaded with coke, lime, &c., or sent out empty, or, if soon to be required, then put on a siding for the time being. Turntables should not be introduced if it is at all possible to do without them, as their adoption means a good deal of trouble and delay consequent on the uncoupling of each individual waggon every time it is used. Weighbridges of from 35 to 40 tons capacity, fitted with relieving apparatus, should be placed in such a position that no materials can be received into, or sent out from, the works without having to pass over one of them. For running the coal, lime, and coke waggon traffic throughout the works, a four-wheeled coupled tank locomotive, with furnace constructed for burning coke, should be employed.

No better system could be adopted of laying the permanent way than that used by the various railway companies. For the standard gauge of 4 ft. 8½ in., the formation level should be excavated for a single line of railway not less than 12 ft. 6 in. broad; the bottoming being 21 inches below the level of the top of the rails. Ballast, consisting of slag from the iron-works, broken to pass through a 2½-inch diameter iron ring, laid to a depth of about 9 inches, makes a first-class bottoming under the sleepers; while good furnace ashes are often used for packing and finishing the track. Sleepers should be of larch or redwood, rectangular in section, properly creosoted, and should measure 9 feet long by 10 inches broad and 5 inches thick, with holes bored for spikes, and the surface under the chairs dressed perfectly level. These should be placed not more than 3 feet apart centre to centre, and closer at joints of rails—as close to the fishplates as the driving of the oak keys in the chairs will admit. Chairs should be of cast iron, weighing not less than 46 lbs. each, and securely held to the sleepers by malleable iron spikes. Fishplates should be of steel, properly made to fit the section of rail; and they ought to weigh not less than 22 lbs. per pair.

Rails should be of the very best description of steel, made by the Bessemer or Siemens process, and should weigh not less than 90 lbs. per lineal yard for the main lines, and 80 lbs. per yard for the sidings. They should be smooth, straight, free from cracks, flaws, or blisters, and sawn perfectly square on ends, with oval holes drilled for fish-plate bolts. The usual length of rails is 24 to 32 feet. Longer lengths would certainly lessen the number of joints; but then the rails would not be so easy handled. Rails are usually fixed to the chairs by oak keys.

Gradients steeper than 1 in 40 should be avoided as much as possible; but often circumstances do not permit of this, and as steep as 1 in 30 is sometimes formed. Curves of a radius of 100 feet and under should have a check or guard rail fitted on the inside of the inner rail, to prevent the waggons coming off. In certain parts of a gas-works, it is advisable to substitute for the ordinary cross sleeper longitudinal sleepers with flat-bottomed rails fixed to them by through bolts. Such rails should have the bottom flange at least 4½ inches broad; and the rail should weigh about 70 to 75 lbs. per lineal yard. In gas-works where narrow-gauge railways are in use for dealing with the coke from the retort-house and lime from thepurifying-shed, I should strongly advise that no section of rail be adopted of a lighter section than 40 lbs. per lineal yard.

Materials.—Before proceeding to speak of the various buildings, I will say just a word or two about the materials employed in their construction. Concrete is usually composed of (say) three parts of clean brick, stone, gravel, retort-material, or old slag broken to pass through a 2-inch diameter iron ring, two parts of river or clean sharp pit sand free from loam, clay, or other earthy matter, and one part of best portland cement, all thoroughly mixed on a platform by being turned over twice dry and twice after water has been added. Concrete for foundations should be put in in layers 6 inches thick and well beaten and levelled; the junctions being left rough, so that when fresh concrete is added it will adhere to the former after being cleaned and well watered. Mortar should be composed of ground and Arden or other make of lime and clean sharp sand in equal proportions. The portland cement mortar is very often made up of one part of cement and two parts of clean washed sand mixed and ground together in a mortar mill. Portland cement should be of the best quality, and weigh 87 lbs. per cubic foot. Moulded briquettes, made of neat cement allowed to set one day in air and six days in water, should not break at less than 450 lbs. per square inch of section tensile stress. The cement should be ground so that not less than 90 per cent. will pass through a sieve of 50 meshes to a lineal inch, or 2500 meshes to the square inch. Bricks should be of the best quality, well pressed and shaped, and hard-burned. They should be properly bonded when laid on walls, and each course of brickwork ought to be grouted with mortar. Joints should not be more than ¼ inch thick, and be neatly pointed and struck on exposed surfaces. Steel should be of the best Siemens-Martin make, of a mild description, capable of bearing a tensile strain of not less than 28 tons, and not exceeding 32 tons per square inch of section, with not less than 20 per cent. of elongation in a length of 10 inches.

Buildings.—The buildings should be plain and substantial, without undue ornamentation. Bricks being the material chiefly used for the walls, quite a pleasing effect can be given by forming panels having projecting and dental courses finishing with a cornice, all of ordinary stock bricks. Terra-cotta bricks for the facings of doors and windows having a slight projection beyond the line of wall might be introduced on the smaller buildings, such as the exhauster and meter houses, offices, &c. The foundations of all walls and piers should be of portland cement or lime concrete, varying in thickness and breadth, depending on the height and weight of walls. From 12 to 24 inches of concrete is about the usual thickness, with a projection of not less than 8 inches beyond the footings of the brick foundations. Rounded corners on all doorway openings which are not provided with hinge doors would be found an advantage, more especially if cart or barrow traffic is frequently to pass through them.

Retort-House and Coal-Store.—The subject of horizontal *versus* inclined retorts is a much-discussed one among gas engineers; but as to their merits I do not intend to enter here. I might just mention at this stage that the retort first employed by Murdoch, more than a hundred years ago, was vertical, made of cast iron, cylindrical in form, with the pipe conveying away the products of distillation near the top. One drawback to this retort of Murdoch's was that it was very inconvenient as regards the removal of the coke. Several patents have been taken out for carbonizing coal in vertical retorts; but the system has not as yet been tried on a large scale, though I understand a small installation is in operation at Exeter. The coal is fed in practically continuously; but the coke is not discharged all at once. A number of years ago, I saw vertical retorts at work in the Maryhill Gas-Works, now the property of the Glasgow Corporation; but the results, as far as I remember, were not considered satisfactory. Each system requires to have certain structural differences; and these I will endeavour to mention briefly.

The retort-house ought to be spacious and lofty, provided with large openings in the side walls for light as well as ventilation, and also with a continuous ventilator or a number of shafts on the ridges of the roof, to carry off whatever smoke and steam there may be. For an installation of horizontal retorts to be worked by power machinery suitable for 10 feet long retorts, set back to back, or 20 ft. 6 in. "throughs," the distance between the side walls or columns should be not less than 60 feet; but this does not give much space, and a space of 75 feet is desirable. The height from the working floor for the retorts to the shoes of the roof principals ought to be about 27 feet; the "stage" or working floor being 10 feet above the yard level—thereby giving

greater facility for discharging the coke from the retorts and for removing same, as well as for attending to the furnaces and flues of the retort-settings.

The stage floor should be constructed of columns, girders, and joists, having rails for the charging and drawing machinery laid perfectly parallel to the retort-bench. Cast-iron plates, having suitable openings for the passage of the coke to the floor beneath, should be placed for a distance of about 6 feet on either side of retort-bench. The remainder of the floor, with the exception of the space where the ventilating gratings and stairways are, should be constructed of concrete over expanded metal, finished on top with a layer of granolithic about $1\frac{1}{2}$ inches thick properly levelled and marked with a small roller. The roof principals should be of steel T-bars, the purlins of angle bars, and covered with slates. For an inclined-retort installation, on account of the charging stage being so high, it is, of course, necessary for the roof to be higher in proportion. An arched girder of the lattice or solid plate description is particularly well suited for the main principals; and the main purlins might be of rolled steel section. Rafters should be of T-bars, and purlins for the slates of L-bars. The absence of tie-rods in the roof principals allows of greater freedom in the erection of the necessary hoppers and elevating and conveying machinery. It is usual to construct two benches of inclined retorts having the charging floor in the centre, and the drawing stages at the sides next the walls; the whole being under one roof of a span of about 110 feet. The heating of "inclineds" is on the same principle as for horizontals—namely, the regenerative system—and therefore the drawing stage should be at least 10 feet above the ground level.

I should mention here that the inclined retort is the invention of a Frenchman named Coze, of Rheims, who tried it in 1885; but it was not until 1889 that the system was adopted in this country. Since then a large number of installations have been set agoing both at home and abroad. These retorts are charged and discharged by gravitation; and the angle varies with different classes of coal. But the angle most suitable for Scotch coals is from 31° to 32°. The labour in charging and discharging the retorts is simpler than for horizontals; but the first cost of the installation of inclines is said to be more than of horizontals fully equipped with machinery.

Retort-house chimneys do not require to be of great height. A number of small ones, projecting a short distance through the roof, is found quite sufficient to give draught to the retort-settings. These chimneys should be lined with fire-brick, built with finely ground fire-clay throughout.

Both the retort-house and coal-store should be thoroughly equipped with machinery for the rapid and perfect handling of the coal from the railway waggons to the loading of the coke, breeze, and ashes into carts or waggons. Stoking machinery for use with horizontal retorts is employed, worked by manual power, and there are also types driven by gas and steam engines, though the most modern systems are actuated by ropes, compressed air, hydraulic power, or electricity. In several gas-works machinery for removing the hot coke in conveyors as it falls from the retorts has been adopted; but the wear and tear must be very great, as well as the friction due to the heat and the streams of water used for quenching.

It is economical to use the coal as freshly wrought from the pits as possible; but stores are necessary inside the gas-works for emergencies—such as colliery and railway strikes, and dislocation of traffic due to fogs and other causes. For works convenient to the coalfields, accommodation for three weeks' supply should be provided; and for those at a distance from the pits, five to six weeks' supply—the basis being reckoned on the consumption required on a December day.

The position of the coal-store in relation to the retort-house is best determined by local circumstances; but in most modern gas-works the waggons enter on an elevated railway (say) 16 feet above the floor level, and provision made for either emptying the coals direct into hoppers supplying the coal-breakers, or discharging direct through openings into the coal-stores.

Heavy walls should be built in the stores to withstand the pressure due to the weight and wedging action of the coal when stored. The roof is usually constructed of light steel principals, angle bars, and covered with galvanized corrugated iron sheeting of a thickness not less than No. 16 B.W.G. The sheets should be thoroughly painted with two coats of red oxide paint both outside and inside as a preservative. Though the first cost of this roof is less than that of a slated one, the durability is much inferior. Capstans and tipping machinery actuated by any of the powers available should be conveniently placed in the coal-store or near where the waggons are required to be often manipulated.

Mechanical coal-breakers are necessary adjuncts of every modern works. These should be fitted with grids or screens to bye-pass the small coal, having rollers for reducing the large lumps of coal and cannel to a suitable size for carbonizing purposes. In connection with these, elevators and conveyors are required for filling the overhead hoppers situated in the roof for supplying the machines and shoots for charging the retorts. The whole of the machinery in the retort-house and coal-store, for coal breaking, elevating, and conveying, should, as far as possible, be in duplicate, as a breakdown in midwinter would be a very serious matter. To prevent this, parts should be made interchangeable, all gearing should be of cast steel, large bearing surfaces should be provided, all bearings should be protected from dust as much as possible, all parts should be well lubricated, and the machinery should be kept clean. Spare parts of the smaller portions of apparatus most liable to wear or give way should be kept accessible in case of need. Machinery for loading, screening, and stacking the coke in the yard should be erected where large quantities of this material have to be dealt with. There are quite a number of systems in operation; but conveyors and elevators, travelling cranes with grabs, and hydraulic cranes are those usually adopted.

Purifying Shed.—Next in importance to the retort-house and coal-store is the purifying shed. The most modern building consists of two storeys, constructed of columns, girders, and joists, having a concrete floor for the upper storey with a roof covering it. This building should be an open shed as far as possible, allowing of a continuous current of air to pass through it. The purifiers should be erected on columns and girders about 10 feet above the ground floor, which is used for the removal of the spent material. On the upper floor the fresh material is stored, prepared, and put down through flexible shoots into the purifiers. The purifiers are usually rectangular boxes formed of cast-iron plates, and may be either of the water-lute or dry-lute type, provided with moveable covers. Inside the boxes grids made of wood are arranged for supporting the purifying agents. Openings should be provided in the bottom plates through which the spent material—lime or oxide of iron—can be discharged into carts or waggons. Elevators and conveyors are successfully employed for dealing with both lime and oxide of iron in the filling and emptying of the purifiers.

Boiler-House.—The boiler-house should, if possible, be placed conveniently to the coke-yard and railway, so that fuel could be easily obtained, and the ashes readily removed. This part of the works does not call for any particular attention beyond the fact that a considerable saving can be effected if the boilers are fitted with patent forced draught blowers in the furnaces, for burning small breeze and fine coke dust. Where there is an abundant quantity of exhaust steam escaping into the atmosphere direct from engines, the feed water for the boilers should be heated thereby, either by employing a feed-pump and water-heater or an exhaust-steam injector. In a range of boilers, it is very common to fit up an economizer of the Green type in the main flue leading to the chimney; thus utilizing the waste heat for heating the feed water before it enters the boilers. These should be regularly inspected, and blow-off and gauge cocks opened and shut at least once a day, so as to ensure that they are in good working order.

Engine and Exhauster, Meter, and Governor Houses.—These houses should be placed as far away as possible from the dust and dirt. The inside of the walls should be tiled for a height of not less than 6 feet, and finished with a dado. Above this they might be plastered, and a neat cornice formed at the top. On no account should the walls be plastered on lath and grounds, as there is danger attending this mode of construction through accumulation of gas, which might cause an explosion. The floors of these buildings should be raised from 5 to 6 feet above the ground level; leaving sufficient room underneath for getting at the various pipes and connections for examination or repair. This space, as well as the upper portion, should be well ventilated. Around the engine and exhauster seats, and also where pipes are brought up through the floor, neat cast-iron gratings should be fitted. The remainder of the floor might be laid with specially prepared concrete over expanded metal, finished on the top surface with either tiles or terrazzo paving. All gas connections in the exhauster-house should be made with flange joints; and if the steam-pipes to and from the engines require to be placed under the floor level, they should be covered with non-conducting composition, and placed as far as possible from the gas-mains. A complete set of gauges, comprising steam, vacuum, and pressure, also recording registers, ought to be placed in a prominent position in the exhauster-house. All machinery throughout the works should properly fenced and protected, but at the same time made accessible for the purpose of lubrication and repairs.

Workmen's Rooms.—For those men chiefly who are engaged in the retort-house, there should be provided, convenient to their duties, suitable accommodation for them to prepare their food or wash and dress themselves. These rooms should be equipped with gas-cooking appliances, as well as baths and washing-basins; and in the dressing-rooms lockers for each should be fitted. There might also be a reading and recreation room for the use of the workers. Rooms should be provided with a plentiful supply of hot and cold water. They should be airy, well ventilated, lighted, and heated, and be lined throughout with white enamelled tiles or bricks. Floors made of concrete and granolithic are best, as they can be easily washed out.

Office, Workshops, and Stores.—These are necessary buildings in all gas-works, as are a well-equipped laboratory and coal-testing plant in the larger and medium-sized works.

Gasholders and Tanks.—In the design and construction of gasholders and their tanks, the engineer has great scope for his skill and ability, as these useful reservoirs represent a large sum in the capital account of a gas undertaking. Therefore economy combined with substantiality should be aimed at. This part of the equipment of a gas-works is of sufficient importance in itself to form the subject of a paper; so I will confine myself to a few sentences of general interest. No engineer at the present day would think of putting into a tank a single-lift gasholder, without making the necessary provision for adding either one or more lifts as the demand for increased storage arose. The cost of the tank

is practically the same for a gasholder of one or more lifts. Tanks are formed of cast iron or steel plates, brick and puddle, concrete, or they are composite—*i.e.*, of brick and concrete. The nature of the ground will often determine the material of which the tank should be constructed. Gasholders are now made telescopic, varying from two to six lifts, with external guide-framing extending the full height of holder when fully inflated, or carried only two-thirds up, allowing the top lift, and in one instance the two upper lifts, to go above the framing. Gasholders 150 feet in diameter and upwards are constructed mostly without trussing for the crown of the inner lift; the curb being made considerably stronger. A timber framing of pitch pine is erected in the tank, to support the crown when the holder is at rest. Gasholders without external guide-framing—I refer to those with spiral guides and the other system of guiding by means of cables or wire ropes—are to be seen in various places. Both systems have their advocates; but the majority of engineers prefer the present form of standards placed round the circumference of the tank. Provision should be made on each holder for conveying steam through flexible hose-pipes, to circulate and heat the water by means of injectors in the cups and tank, and so prevent it freezing.

Carburetted Water-Gas and Oil-Gas Plants.—In several coal-gas works, carburetted water-gas plant has been installed, not so much for the purpose of supplanting the existing methods of gas manufacture, as to have a portion of plant capable of making, at a small cost, a quantity of gas of high quality for mixing with the coal gas in the necessary proportion to insure the standard illuminating power being supplied to the consumers. Oil-gas plant is also used as an enricher for mixing with coal gas. Some of the advantages claimed for these plants are: (1) That the ground space required is very much less than is necessary for coal-gas plant. (2) The facility with which the plant can be started (a few hours only; and it is possible to stop it instantly). (3) Reduced output of coke. (4) Fewer men are required to work the plant. (5) It is a very useful adjunct in a manufacturing city subject to sudden fogs. By adopting the foregoing plants, a new material in the shape of oil has to be dealt with; and storage tanks and pumps have to be provided for this purpose.

Steam Pipes and Valves.—The working pressure on steam-boilers is quite common at 100 to 150 lbs. per square inch, and even higher; nothing therefore but the very best of materials and workmanship for pipes, fittings, and valves should be employed. Pipes made of lapwelded or weldless mild steel tubes, with wrought steel forged flanges welded or screwed on, and then riveted over, having branches formed of steel tube riveted to the main pipes and caulked perfectly tight, are usually installed. One advantage of using steel pipes is that they can be supplied in lengths of from 15 to 18 feet, in place of 9 feet when cast-iron is used; and they are more reliable where high pressures are required. Behind each steel flange a fillet of at least ½ inch radius should be formed, the flanges faced, the bolt-holes drilled.

Expansion should be taken up by mild steel bent pipes of large radius, thereby avoiding the use of expansion joints having stuffing-boxes, which are objectionable. Specially made bends are now designed for taking up the contraction and expansion in a line of steam-piping. The straight lengths should be anchored, so as to make the expansion bend act. There should be provision for removing the condensed water automatically at the lowest points of the system, and suitable steam-traps fitted. All pipes and valves should be subjected to an hydraulic test pressure of 350 lbs. per square inch. Valves should have renewable seats made of gun-metal; and great care should be taken that all parts of the valve are of uniform thickness, in order to keep tight under all conditions. Suspend overhead steam-pipes from wall or other brackets by slings and rods, to allow of free expansion.

In coupling up two or more steam-boilers, the main pipe should not be connected directly to the flanges of the steam-valves on the boilers, but a bend with a large radius should be placed between each valve and branch on the main steam-pipe, to give a certain amount of elasticity, thereby saving the joints from leaking when it is necessary to shut down any of the boilers for cleaning or repairs. Steam-pipes and valves of 3 inches diameter and upwards should be provided with flanges; the smaller sizes would do with ordinary screwed couplings. It will repay one to give a good price for valves, as there are so many worthless types in the market. How annoying it is, after fixing up a number of lengths of steam-pipe, to find the valve will not keep tight, even with a moderate pressure. Flange joints should be made with stamped corrugated brass or gun-metal rings, and then red-lead smeared over them. These rings should be placed inside the bolt circle, the inside diameter of the ring being ¼-inch larger than the bore of the steam-pipe.

Pipes under 2½ inches diameter when laid under ground should be covered with composition protected from the soil by a wooden box properly tarred—the covering of the box to be easily removable. Where steam-pipes above 2½ inches diameter have to be placed underground, a brick or concrete trench properly drained should be built, with recesses formed of sufficient size to allow of the bolts and flanges being properly screwed up. The trench should be covered with cast-iron plates closely jointed, so arranged that they can be easily renewed if required. Great care should be taken, in making joints of pipes, to have the flanges perfectly fair and square to each other. Unless they are so, there are certain to be unequal strains produced when drawing up the bolts; and possibly the result is a fracture causing considerable trouble and damage.

In a trench in which steam-pipes are laid, short pieces of malleable iron should be placed in the bottom where the flanges come, to allow for slight movement. Steam-valves of 3 inches diameter and upwards should be fitted with externally-screwed gun-metal spindles and large handwheels. All steam-pipes, fittings, and valves should be well painted after erection, and before being covered with asbestos or equally suitable non-conducting composition, to prevent loss by radiation. Composition, where exposed, should receive two coats of boiled tar.

Mains, &c.—In laying gas-mains, they should be given sufficient fall to the self-acting seals placed on the syphons. It is advisable to provide pumping-pipes in the syphon-wells in case of a stoppage at any time in the overflow pipes from the seal-boxes. All valves on the gas and tar mains shall be examined regularly by turning them to ascertain that they open and shut freely. The spindles should be kept oiled, and indicators placed on all valves to show whether they are open or shut. Cleaning and inspection doors should be provided at convenient places on all gas and tar mains, allowing ample room for cleaning out the main from these openings. Sharp bends should be avoided as much as possible. Cast-iron gratings should be placed over all self-acting seals and valves at the ground level, to allow of readily getting at them. Gauges showing the vacuum or pressure, and also thermometers, should be placed on mains at prominent parts on the works, so that those who are in attendance can note the readings, and be forewarned should anything unusual be observed. Foul mains from the retort-benches should be arranged to give a slow travel to the gas, in order to cool it gradually before it reaches the condensers.

Tar and Liquor Tanks.—The tar and ammoniacal liquor should be collected in large underground storage tanks, provided with special pumps for lifting the products and discharging them into the tanks at the chemical works or into tank-waggons on the railway adjoining. These tanks should be watertight, and provided with manholes for the purpose of inspection or cleaning.

Painting.—Gasholders, with their external guide-framing, the iron and steel work of roof principals and floors, &c., must be kept in good order; and to do this, it is of the utmost importance that the work of painting should be carefully and regularly done. In the first place, all blisters, scale, and rust must be cleaned off before any paint is put on. There is no way of stopping the rusting of iron or steel when it has once begun; so to prevent it forming as much as possible the plates and bars should be cleaned with steel scrapers and steel wire brushes, and before leaving the contractors' works dipped or coated with boiled linseed oil applied hot, and then given one coat of red-lead paint. Of course, it is to be understood that the iron or steel is perfectly dry before being coated.

After erection, the structure should receive two coats of pure oxide of iron or anti-corrosive paint of approved colour. Any iron or steel work embedded in ground should have two thick coats of boiled coal tar. Great care should be taken in the selection of paints, as adulteration is much practised. The bases of the best and most durable and preservative paints are boiled linseed oil, turpentine, red lead, white lead, and red oxide of iron. A good paint should dry in from ten to twelve hours, and remain on the part painted. Should it be "tacky" to the touch at the end of that time, then the composition of the paint has not been right, and a quantity of dryer should be used. But this should only be done judiciously. The price of the paint, added to the cost for painting, amounts in a year to a pretty large sum in a medium-sized gas-works; hence the reason for buying only a first-class paint which will give satisfaction.

Residual Products Works.—In many gas-works, buildings and apparatus for the recovery of cyanogen, the manufacture of sulphate of ammonia, the distillation of tar, together with benzol and carbolic acid plant, and also the manufacture of sulphuric acid, are installed. The results obtained therefrom form a very considerable source of revenue to the undertaking.

Discussion.

The President said he was sure the members were all very much indebted to Mr. Smith for his able and instructive paper. The subject chosen was peculiarly appropriate to the occasion, beginning, as it did, with the site for a gas-works, and noting all the considerations in the construction. It bristled with points of interest, which might be elaborated a little more; and the best way to show their appreciation of it was to freely discuss it.

Mr. J. Barker (Greenock) referred to Mr. Smith's views regarding the taking in of coal at a high level. In some works, he said, the coal was brought in at the ground level, and was raised by an elevator and conveyed across the railway into the retort-house. This method, he thought, might be cheaper in the end than putting up a fixed stage-floor.

The President said there was one point in the paper which struck him—the putting of ashes upon railway tracks. Ashes were very bad for getting into the bearings and causing friction. He considered ballast should be free from dust and grit, though, perhaps, this did not matter so much in sidings. Then there might be two opinions about the colour of oxide paint for the painting of the roofs of coal-stores. Must it be red? Another point was the flanged ring in making steam-joints. It was only a few years ago that these were brought out, and previously steam joints had been made perfectly tight without them.

Mr. G. Brown (Tradeston) pointed out that Mr. Smith had spoken of coal storage for three or five weeks being necessary;

but he thought they had had occasions in Glasgow when they required from ten to twelve weeks' storage.

Mr. W. A. WHITE (Falkirk) said Mr. Smith had spoken of a height of 10 feet on the under side of the purifier-boxes. This might be all very well for manual labour; but if they had a railway there, he was afraid that 10 feet would be too little. In his opinion, 15 feet would be better.

Mr. S. B. LANGLANDS (Glasgow) thought Mr. Smith had been a little severe upon spiral-guided gasholders. He (Mr. Langlands) had put up one of those holders, and would do so again. In holders up to 150 feet in diameter he would still adopt this method of guiding. There was a saving in material, in (say) a 70-feet holder, equal to £200, which was a considerable sum in a small gas undertaking. The principal objection to these holders was that they rocked in the wind; but his experience was that there was less rocking with them than with guided holders. He believed that about 2 inches was the extent of the rock experienced with the holder he put up. But they should always take into account that there must be a spiral guide-plate. He was at one with Mr. Smith on the subject of steel tanks. His sole objection to them was that at the wind and water line there was always sure to be corrosion; and he wondered, in his last works, whether it would not be better to adopt what they used in ships—a composition of bitumastic material. In regard to roads through the works, Mr. Smith had omitted to put forward the claims of tar macadamized roads. This was something they could do themselves. In works in which he had been engaged, they used up all their tar in making roads in the town, and were very successful. In dealing with the water supply to gas-works, he would advise, in all cases, that turned-and-bored joints should be used. He had had experience of pipes with these joints, which had been down for twenty years, and there was no leakage. One thing that occurred to him, with regard to inclined retorts was this: If they were so successful, why did they require a pusher to send out the coke?

Mr. A. WILSON (Glasgow) congratulated Mr. Smith upon his paper, and also the Association on the splendid start they had made. He was glad to see so many members present. He hoped the good attendance would continue, and thought the best way to keep up the interest would be to have good discussions upon the papers. He considered the paper before them almost too good; it was too elaborate. It was so good, indeed, that they ought to have it printed, and let every member have a copy. There were many points in it which might be referred to at another time, if they had it by them; but to discuss them *seriatim* was scarcely to be expected. He thought he might safely offer a word of advice to those who were to give papers, to keep them rather shorter; make the points outstanding, so that those members who were learning their business might grasp them. Then they might expect to have exhaustive discussions. The life of an institution such as theirs was discussion. The President's address was got up in capital style; and he must congratulate him upon it. He hoped the papers in future would be equally valuable.

Mr. SMITH, in closing the discussion, thanked the members for the kindly way in which they had received his paper. But he would have liked a little more discussion on it. With reference to Mr. Barker's remarks, the advantage of high-level coal-stores was that they saved in the emptying of the coal, and it could be distributed over a larger area. As to ballast for railways, what he referred to was sidings, where the speed of the trucks was not so great as upon main lines, and where there was not much risk of dust affecting the axles. The President was right as to the colour of the paint; it might be of any other colour than red. He hoped they would never require to store coal for ten or twelve weeks. As to the height under the purifiers, he fixed it so as to allow of a horse and cart getting in. He had never seen a spiral-guided gasholder of large size, and he thought he would still pin his faith to the standards. It was really an omission on his part not to mention tar macadam. This was a form of road making which he thought might be adopted more largely than it was. As to inclined retorts, he was not aware that a pusher was used. He believed it was installed at one time, but he did not know if it was used now. There were instances in which the coke came away when simply "tickled" at the bottom.

The PRESIDENT said he was going to ask the members to give Mr. Smith a vote of thanks, but they had already done it.

Arrangements were then made for the visit of the Association to the Granton Gas-Works, which is the next event on the syllabus; and the proceedings terminated.

Improved Gas Volumeter.—In the "Zeitschrift für analytsche Chemie," M. Grustzkiewicz recently described an instrument which avoids the inconvenience caused by the performance of the reaction in the gas-burette itself, and those resulting from the use of caoutchouc for connecting a reaction flask with the eudiometer. The general plan of the apparatus is that of Lunge's gas-volumeter; but the reaction vessel, which consists of two concentric glass cylinders—the inner one being open at the bottom and stoppered at the top, while the outer one has a stopcock at the bottom and a side burette for admitting reagents—is connected with the top of the eudiometer by a glass tube. Mercury is drawn into the reaction vessel before an analysis is commenced; and the agitation of the liquids is entirely effected by raising and lowering the mercury reservoir. The apparatus can be employed for all analyses involving the measurement of a gaseous product.

DESTRUCTIVE EXPLOSION AT THE BIRMINGHAM (SALTLEY) GAS-WORKS.

One Man Killed and Several Seriously Injured.

An explosion the disastrous extent of which had not been fully measured as this issue of the "JOURNAL" was proceeding to press, occurred at the Saltley Gas-Works of the Birmingham Corporation yesterday morning, at about five o'clock. The catastrophe was due to the blowing of the purifier lutes in No. 2 section of the Saltley works; but the source of the light which ignited the gas has not, at the moment of writing, been ascertained. The explosion must have been of a terrible nature, judging from the shocking amount of injury that it inflicted—both to men and property. One man was killed, and four were seriously injured. It is to be hoped that the worst is known in this respect. The four unfortunate men were taken to the General Hospital. Their names are: Frank Williams, George Gibbons, Herbert Elkington, and Thomas Newton. The end of the building and the roofs were completely wrecked; and several of the purifiers were seriously damaged. But the full extent of the effects of the accident cannot be known until the *débris* has been removed. Not only within the works, but the surrounding property sustained somewhat extensive injury, bearing testimony to the force of the explosion—several houses having had their windows blown out and chimneys thrown down. It was not expected yesterday afternoon that there would be any interruption whatever of the supply of gas to the city in consequence of the accident. Not only will there be much sympathy with those who have so terribly suffered and their relatives, but with Mr. Henry Hack, who is plunged into a position of very considerable anxiety.

A Birmingham correspondent telegraphing last night said: An explosion involving the death of one man and injury to six others took place at the Saltley Gas-Works of the Birmingham Corporation early this morning. Saltley is now the principal works of the Corporation, and a large number of hands are employed there; but fortunately not many were on the premises at the time, or the consequences would have been appalling.

Shortly before five o'clock, a workman named Frank Jordan discovered the presence of a large volume of gas in the purifying-house; the gas escaping from the lute of one of the purifying-boxes. Jordan immediately called four fellow workmen to his assistance; and they attempted to cut off the section. While this work was in progress, the explosion occurred; the purifying-house—a building some 100 yards long—was almost completely wrecked. The end was blown out of the retort-house; and other parts of the buildings were seriously damaged. The report was heard all over the city; and for many miles around the greatest consternation prevailed. The day-shift had not arrived; and there were few people in the works. The fire brigade was summoned; and a portion of the men set to work to rescue the injured; while others played upon the fire which had been caused by the explosion. Jordan was not found for several hours; and then he was discovered beneath a fallen wall terribly disfigured. His four fellow workmen were also very badly injured; and the recovery of three of them is doubtful. They all lie at the General Hospital.

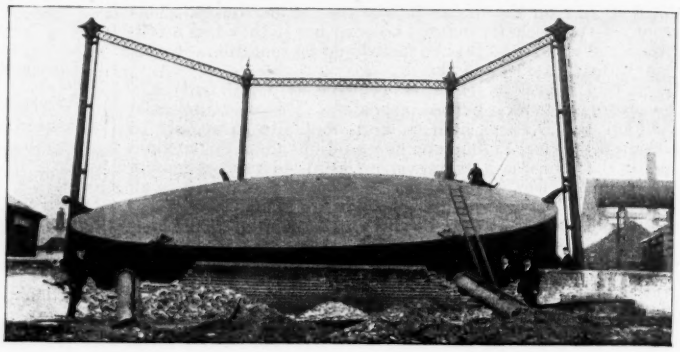
While the firemen were engaged in removing the *débris*, another explosion took place through the liberation of some pent-up gas; and two firemen were incapacitated.

Outside the works, the people were terror stricken—windows were smashed, doors were torn down, pictures removed, and many people were thrown out of their beds. The lamps in the signals on the Midland line which runs alongside the works, were put out; the windows in the signal-box were smashed, and the signalman injured. The permanent way was also disturbed; and the telegraph wires were broken. It was by far the most serious explosion which has ever taken place in Birmingham.

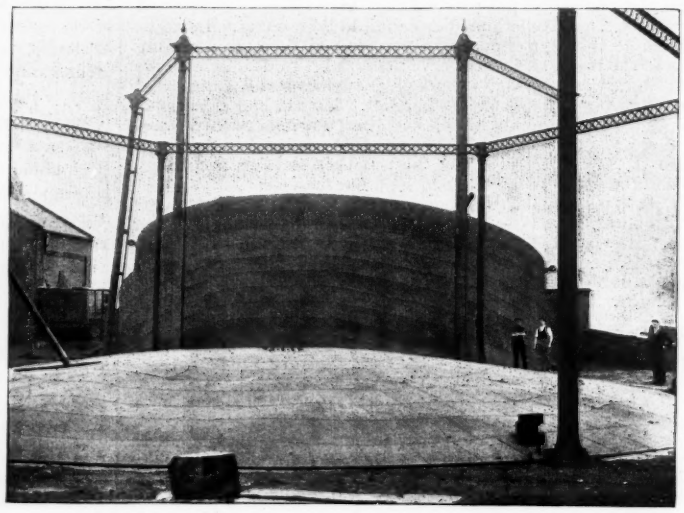
The purifying-house (which stands between one of the retort-houses and the scrubbers) is a two-storey building, the top portion of which is utilized for the manipulation of the lime used in the purification process. It is pretty certain that the gas escaped through the blowing of the lutes; but Mr. Hampton Barber declined to express any opinion on this point. It is not known, he says, what led to the explosion, or in which portion of the purifying-house it occurred; and until the *débris* had been removed, the officials would make no report. The matter has been further complicated, he adds, by the death of Jordan. A great deal of the plant has been destroyed; and the damage may be estimated at anything from £10,000 to £20,000. Mr. Barber lives five miles from Saltley; and he heard and felt the effect of the explosion. The Lord Mayor and many members of the City Council visited the works during the day.

A GASHOLDER ACCIDENT AT THE NEWTON-IN-MAKERFIELD (EARLESTOWN) GAS-WORKS.

One of the most remarkable effects of the great storm which raged over Lancashire last Thursday was the wrecking of a gasholder at Earlestown, the property of the Newton-in-Makerfield Urban District Council. There are three gasholders at the works available for use; and No. 2, which is a telescopic holder, erected in 1875, appears to have caught the full force of the gale, which was blowing in an easterly direction. The cast-iron columns supporting the holder were snapped and lifted out of their seats; and the holder itself was thrown into an inclined position. The governor-house narrowly escaped destruction; and this was fortunate, as otherwise the district would have been plunged into darkness. The holder was full of gas at the time, though not then in actual use. It had a capacity of 102,000 cubic feet; and the gas, which escaped between the lifts, was quickly dissipated by the hurricane. The watchman found out what had happened at about two a.m., and the Gas Manager, Mr. J. T. Hoggard, was soon on the scene. When everything appeared safe, nothing further was done until dawn, when the Chairman of the Gas Committee (Mr. Thompson) and the Engineer (Mr. A. Bowes) made a complete inspection. The damage is estimated at above £1000. About an hour previously the scaffolding at the Council's new waterworks, a mile away, were likewise demolished. Here Messrs. Cubitt and Co., of London, are erecting a ferro-concrete reservoir; and in the fall some of the outbuildings were damaged.



The Wrecked Holder at Earlestown.



No. 1 Holder in the Foreground—the Wrecked Holder in the Rear.
[*Photographs by T. Unsworth, Earlestown.*

Our correspondent at Earlestown writes: In a conversation on the subject of the accident, Mr. Hoggard stated that at the time he was called up on the morning of the accident, the wind was blowing so strongly that he had great difficulty in keeping his footing. His examination of the holder soon showed him that the shell of the outer lift had "cocked up" outside the tank, and that the top lift had buckled into it—just, as he descriptively puts it, as if a person had sat down suddenly on a silk hat. Two of the cast-iron columns and two girders had gone over into the field beyond the boundary wall; and the wall itself was knocked down. The conclusion come to from the inspection at daylight was that the castings were very weak for the length of the columns; and at the base there were defective parts in them. The columns were about 34 feet in length. The holder is a complete wreck, and will now require two new shells and standards. Four of the six columns are broken, or more or less damaged.

The holder is 60 feet in diameter, and the lifts 18 feet deep, and it has been in regular use, almost without a break, ever since its erection. At the time of the accident, new guide-rollers were being made for the top and bottom lifts; Messrs. Clayton, Son, and Co., Limited, of Leeds, having this work in hand. Fortunately, when Mr. Hoggard first came to the works, he advised the Committee to put two lifts to one of the largest holders; and this was completed about two years ago. The works have increased lately on account of the greater demand for gas; and if this extension had not been carried out, the works would have been placed in a very awkward position, and the supply jeopardized. No. 1 holder, it may be mentioned, was also out of order at the time, and was not in use, as will be seen by one of the photographs. Our local representative also saw Mr. Swann, the ex-Manager, who said that when the holder was erected, there was some trouble with the tank.

FRACTIONAL COMBUSTION OF GAS MIXTURES.

According to Herr F. Richardt, writing recently in the "Zeitschrift für anorganische Chemie," it is impossible to remove the hydrogen from a mixture of carbon monoxide and hydrogen by combustion in such a manner that only carbon monoxide remains. The combustion of this gas in presence of heated palladium is complete at 300° C. In presence of heated palladium wire, methane (CH_4) is not attacked by oxygen when the temperature does not exceed 450° C. Above this, and under a visible red heat, methane is attacked when it is in contact with the palladium wire for a sufficiently long time. When a current of methane and air is, however, quickly passed over palladium wire, there is little combustion even at 600° to 650° C. The influence of hydrogen on the combustion of methane in presence of palladium has also been studied. Any hydrogen present with the methane is burned completely at 450°, even if the contact with palladium be short, and hydrogen does not affect the combustion of methane, excepting that the retardation in the ignition disappears on account of the rise of temperature caused by the combustion of the hydrogen. Ethane (C_2H_6) behaves like methane.

Ethylene begins to burn even at 300° C., but cannot be fractionated from methane or ethyl-hydride (C_2H_6), as the ignition temperature of these two gases would be overstepped. The delay in ignition of methane indicated above finds its explanation in the observation of Mallard and Le Chatelier, that explosive mixtures of methane and oxygen, when raised to the ignition temperature, do not explode at once, the retardation in the ignition amounting, at 600° to 700° C., to about 10 seconds, but diminishing with rise of temperature until at 1000° C. it is imperceptible.

In the determination of hydrogen by Bunte's method (which consists in passing the gas, mixed with air, through a heated capillary tube containing palladium wire, and noting the contraction of volume of the gas), the temperature has to be carefully regulated. If, as is commonly recommended, the palladium is heated just to visible redness, a sensible amount of the methane is burned. If, however, the tube is heated just until the alkali of the glass colours the bunsen flame, and the gas is led quickly through the tube, no methane is burned, while the hydrogen disappears completely. One passage of the gas is sufficient; but it may safely be led over again if desired, at even a higher temperature, since in the absence of hydrogen the retardation in the ignition protects the methane from attack.

It is generally supposed that a ton in the United States of America is 2000 lbs.; but, as a matter of fact, there is no legal definition of what constitutes a ton weight except the standards authorized or established in the individual States of the Union. These are by no means uniform. For instance, a ton of bituminous (soft) coal in Ohio is 2000 lbs. In Pennsylvania, a ton of anthracite (hard) coal is 2240 lbs. Apart from certain minerals and heavy products, the ton means 2000 lbs. in all ordinary commercial transactions. In some districts, the two standards are popularly known as the long ton and the short ton. For transportation purposes, they are usually distinguished as the gross ton and the net ton.

GAS ENGINES AND ELECTRIC POWER.

The best reply to the following paragraph from the "Electrical Magazine" is perhaps to be found in the article on "A Gas-Driven Electric Light" plant, which appeared in the "JOURNAL" for the 27th ult., together with a portion of the presidential address of Mr. James Lowe, delivered last Saturday at the meeting of the Western Division of the Scottish Junior Association, as published on pp. 105-7.

We need hardly remind our readers of the numerous failures of gas-plant installed for public lighting and power purposes in this country and their subsequent displacement by steam—this only after months or years of patient effort to cope with the troubles constantly arising. They are striking instances of a laudable effort to exploit the gas-engine at an unfavourable epoch in its career, and of the reaction which followed as a natural consequence. It must be admitted that the gas engineer has an uphill task before him; but so far he has contented himself with his smaller trade, and either ignored or given but scant attention to work having a far wider scope and greater influence on his particular branch of industry. Meanwhile the steam engineer has made the most of his opportunity; and, perfecting the earliest machines at his disposal, through horizontal and vertical reciprocating unit to the simple rotary engine now being developed in a vertical form, he has widened considerably the gaps between himself and his gas rival, who remains far in the rear wrestling with those similar, though more pronounced problems which he has successfully overcome. Discouraged by the competition of steam in the electrical world and supported by a small trade which admits of no striking developments, the gas engineer is being led along a *cul de sac*. But judging by events he does not see this. Circumstances generally have hampered rather than encouraged the use of large gas-engines; and seeing that the electrical industry has committed itself so largely to the use of steam, the task before the gas engineer is an even more heavy one. Pledged as we now almost seem to steam on every hand, the task of introducing gas-engines will resolve itself probably into capturing the smaller stations, and trusting to the march of events to hasten the day of the large gas-engine and ultimately the gas-turbine.

THE FLOW OF GASES IN PIPES.

At the Annual Meeting of the Pacific Coast Gas Association, the above subject was brought under the notice of the members in a paper read by Mr. L. P. LOWE, of which the following are the principal portions.

Since the inception of the gas business until almost the present time, very little more than passing thought and attention have been given to the subject of the flow of gases in pipes; superintendents and engineers of gas companies making and delivering artificial gas having been more or less satisfied with existing conditions, and when troubled with an insufficient gas supply to consumers have temporarily removed the difficulty by laying additional or larger sized gas-mains, while still retaining the initial low gas-delivery pressure given by the holder.

For this condition two cardinal reasons have been principally responsible, one of which has been the very strong prejudice existing against the use of anything but cast-iron pipes for street-mains; the other being the general belief that if manufactured gases were subjected to even very slight pressure, it would cause a loss of illuminating power—this loss supposedly so rapidly increasing as pressure increased that if but a few pounds were applied, a total loss of illuminating value would be the inevitable result. As "candle power" then meant everything, a mere suggestion of increase of pressure was looked upon as being heretical and even traitorous.

The flow of gases in pipes is governed by five factors—specific gravity, initial pressure, terminal pressure, length of pipe, and frictional resistance; all being more or less controlled by local conditions. For many years gas men depended on the well-known formula of Dr. Pole in calculating the quantity flow of gases in pipes. So far as it goes, this formula is very useful; but its limitations are soon reached, as it fails to take into consideration the fact that a volume of gas occupies a space in direct proportion to the number of "atmospheres" exerted upon same. An "atmosphere" is 14·7 lbs. per square inch, or (say) 15 lbs., as it is so considered in practical calculations where extreme accuracy is not required. If a cubic foot of gas at atmospheric pressure is subjected to an additional "atmosphere" shown on an ordinary pressure-gauge (for instance, in a cylinder fitted with a piston), its volume will be reduced to 0·5 cubic foot. If now an additional "atmosphere" of pressure be exerted (say 30 lbs. gauge pressure), the original cubic foot will be reduced to 0·33 cubic foot; and so on until the point of liquefaction is reached, which, however, will never be the case in the practical delivery of illuminating and heating gases for commercial uses.

It will be noted that by compressing gas a very much greater quantity of what is known as "free gas"—that is, gas measured at atmospheric pressure—can be placed in a vessel of a given size than the actual cubical contents of the vessel. For instance, a tank which will contain 1000 cubic feet of gas at atmospheric pressure will, at a gauge pressure of (say) 15 lbs., contain 2000 cubic feet, and at a gauge pressure of 30 lbs., 3000 cubic feet, and so on; and as this factor is not taken into consideration in the Pole formula, it is useless in connection with what is now known and recognized as high-pressure gas delivery, but very useful, and comparatively simple, if only ordinary gasholder pressures are to be considered.

Several years ago, when the writer first set about seeking a reliable formula governing the flow of gases in pipes under very heavy pressures and over distances running into hundreds of miles, he found an almost entire lack of general, and very little individual, information on the subject. Eastern natural-gas men were appealed to; and while some were obliging and courteous to the extent of calculating and giving answers to specific problems, none would furnish his formula, which he seemed to treasure and hide within his bosom as though of untold value.

Manufactured and natural gases are, however, nothing more nor less than elastic fluids, such as air and steam; and fundamental information was sought in these fields, with the result that, step by step, a formula was developed which was thought to be reliable. It is as follows:

$$Q = C \times \frac{P + 14{\cdot}7}{14{\cdot}7} \sqrt{\frac{D^5 \times (P_1 - P_2)}{0{\cdot}0761 \times 5 \times \frac{P_1 + 14{\cdot}7}{14{\cdot}7} \times L}}$$

Where P_1 = initial gauge pressure;
P_2 = terminal gauge pressure;
S = specific gravity of gas;
D = internal diameter of pipe in inches;
L = length of pipe in feet;
C = a "variable constant." (For value of C, see below);
0·0761 = weight of 1 cubic foot of air at atmospheric pressure;
Q = cubic feet of gas per minute at atmospheric pressure.

Values of constant.

Diam. of pipe, inches.	½	2	3	4	5	6	7	8
Constant . . .	36·8	52·7	56·1	57·8	58·4	59·5	60·1	60·7
Diam. of pipe, inches.	9	10	14	16	18	20	22	24
Constant . . .	61·2	62·1	62·3	62·6	62·7	62 9	63·2	63·2

It will be noted that in this formula the constant changes (if it may be so explained) with pipes of different diameters, owing to the very greatly increased frictional resistances in those of small size. If only a single constant is used, a formula is not reliable until pipes become of such large size as to permit of the use of such constant. It must be remembered, however, notwithstanding the fact that the formulæ are empiric—that is, developed from experience—they become largely theoretical owing to local conditions, and must be accepted as such.

This particular formula may be said to have been proved, owing to the following incident: The writer, in seeking practical information governing the transmission of gas through long high-pressure lines, discussed the subject at length with an Eastern engineer who has deduced a formula for the flow of natural gas from about 20,000 observations made at different line points during an entire winter—recording gauges having been probably largely used. A gas-flow computer had been worked out from the information secured, and replies could therefore be, and were, immediately given to numerous hypothetical queries, though an inspection of the computer, which was one of the slide-rule type, was not permitted.

Subsequent comparisons of this practical information were made with calculations from the above formula, and found to so nearly tally as to be almost identical. The formula is therefore looked upon by the writer as being reliable, so far as knowledge borne of the present state of the art permits. It is based on pipe-lines constructed of wrought pipes joined with ordinary screw fittings, and contemplates straight runs, without sharp right-angle bends, which destroy the kinetic energy of the flowing gas, and thus greatly reduce the efficiency of operation.

Much has been said and written, but very little understood and appreciated, on the importance of preserving to the utmost practical extent the kinetic energy of flowing gas, and as the term is one but seldom used, it may be well to explain that by kinetic energy is meant the power stored in a moving object which keeps it in motion after the source of power has been removed. In the case of the flow of gas through pipes, if the flow is derived at the expense of mechanical power, it means increased cost of operation when the ordinary short-bend fittings are used, and a saving when long-sweep fittings are adopted; and the longer the sweep the greater the saving.

As an illustration, let us assume a 4-inch pipe a mile in length, through which it is proposed to deliver gas of ·450 sp. gr.; the initial pressure being 10 lbs. and the terminal or final pressure being that of the atmosphere. If this pipe is laid on a level and in a straight length without bending, the quantity of gas delivered per minute (as determined by the formula) will be 564 cubic feet. Assume now the same conditions, except that at the distance of half-a-mile the pipe turns at a sharp right angle, and runs an additional half-mile. To deliver the 564 cubic feet as with the straight example, the pressure required will be 10·9 lbs.—an increase of 9 per cent. Assume again that in the mile length three

sharp bends are used. Under these circumstances, a pressure of 11·3 lbs. will be required to deliver the 564 cubic feet per minute, or an increase of 13 per cent. over the straight example. The increase of pressures required is due to the loss of kinetic energy, which will be very much lessened if the long-sweep fittings are used.

As pressures increase, the percentage loss is even greater. For instance, if the same example is taken as that given above, save that, instead of using an initial pressure of 10 lbs., one of 50 lbs. is employed, with a terminal atmospheric pressure, the delivery of gas through a straight section will be 2050 cubic feet per minute; while if in the same length of pipe there are three sharp bends, the amount of pressure required to accomplish the same gas flow will be 60·3 lbs.—an increase of 20·6 per cent.

The problem of high-pressure gas delivery is just now attracting much attention from gas engineers, and several more or less reliable high-pressure formulæ governing the flow of gases in pipes have been published. As in the case of the formula given above, they almost all involve a calculation of the power; and as this is somewhat of a tedious one, Mr. F. H. Oliphant, a natural-gas engineer and expert, has given, in the report of the Ohio Geological Survey, a formula from which has been eliminated the fifth power calculation. It is as follows:—

$$Q = 42a\sqrt{\frac{p_1^2 - p_2^2}{l}}$$

where Q = cubic feet per hour as above, p_1 and p_2 are gauge pressures *plus* 15 lbs. at the intake and discharge ends of the line, and l is the length in miles. The factor a is found for various sizes of pipe in the following table:—

Diam. Inside.	a.	Diam. Inside.	a.	Diameter. Inside.	Diameter. Outside.	a.
0·25	0·0317	5	60	14·25	15	863
0·50	0·1810	5¾	81	15·25	16	1025
0·75	0·5012	6	96	17·25	18	1410
1·00	1·0000	8	198	19·25	20	1860
1·50	2·9300	—	—	Riveted or cast-iron pipe.		
2·00	5·9200	10	350	20·00	..	2055
2·50	10·3700	12	556	24·00	..	3285
3·00	16·5000	16	1160	30·00	..	5830
4·00	34·1000	18	1570	36·00	..	9330

This last formula is for a pipe of 1 inch diameter; and as the delivery increases more rapidly than the square root of the fifth power of the diameter, the cube of the diameter divided by 30 is added to this radical. Where the gravity of the gas varies, the quantity found is multiplied by the square root of 0·6, divided by the square root of the gravity as determined. Problems worked by this formula, as against the more elaborate one given above, show that when gas is delivered at comparatively low pressures —say up to 10 lbs.—the results are very nearly alike; but as pressures increase, and especially when they become rather high (say about 100 lbs.), the results exhibit a considerable difference, the formula given by the writer showing a greater amount of gas delivery than the one given by Mr. Oliphant.

It seems almost unnecessary to call attention to the fact that the manufacturers' stated sizes of pipes are only nominal and not actual, and that the pipes known as "casing" (as well as boiler-tube weights), as usually carried in stock, are designated by their outside and not inside dimensions, but it is only the inside dimensions which count in connection with the flow of gas. The practical lessons to be learned in pipe laying, so as to afford the best conditions for this flow, are: Procure a pipe having a smooth interior surface; protect it as well as possible against corrosion; lay it in a careful manner, and in such a way as to give as smooth and flush inside joints as possible; use long-sweep fittings, even if they must be specially made; and in making service or other connections, see that the main pipe is not obstructed thereby.

In the course of the discussion on the paper, Mr. Doherty said he had been anxious to develop a rational formula for computing flow for any pressure. He also felt that all liquids ought to follow the same general law; and one or two constants which should be added would be for density and friction, which would bring the gas and liquid formulæ together, and thus get rid of Mr. Lowe's "variable constant." He asked what the figures 0·0761 were. Mr. Lowe replied that they represented the number of cubic feet of air. The Pole formula took into consideration initial pressure only. As a matter of fact, the lower formula was a modification and development of the one by D'Arcy. If the members would seek in other fields, as he was compelled to do, for information on the flow of gas, they would find the most reliable was that concerning the flow of steam. The laws which governed this (making allowances for the different specific gravity of gas and steam compared with ordinary gas) would be found very useful in studying the flow of other gases. In the course of his investigations, he consulted all the sources of information he could find, including experiments with compressed air carried out over a length of pipe extending to five or six miles; and even then it was a matter of two or three years' work. Mr. Martin, who had accompanied Mr. Lowe on his travels when seeking information on this subject, remarked that one rather peculiar thing in regard to their investigations was that the results they obtained from the gentleman in Connecticut were within a fraction—say, 1½ per cent.—of those shown by the formula presented by Mr. Lowe; and they were obtained by means of 20,000 observations made on pipe. Mr. Doherty said the point he wanted to make was that high pressures—a comparative term—were new in the gas business, though they had been employed for some time. Their great advantages were not made apparent by any formula. Gas engineers did not give any substitute for Pole's formula; and, in his opinion, they either did not possess any knowledge in regard to the flow of gas in pipes, or else they were very selfish in the use of the formula. The flow of gas increased only as the square root of the pressure; and before much additional conductivity was obtained by high pressures, the pressure had gone beyond all bounds. While he was quite aware that high-pressure gas distribution had come to stay, he considered it had been an evolution in which the cart had gone before the horse. Mr. Lowe said he had not been able to find any gas men who possessed much knowledge of the subject. He added that his principal object in writing the paper was to call attention to two things—first, that gas managers need not have any fear as to very great injury being done to their gas as the result of compression, no matter to what extent this might be carried; and, secondly, that it was absolutely necessary to use long-sweep fittings, and good ones, if they wished to derive all the benefits possible from high-pressure gas distribution.

Alloys of Rare Earths for Ignition and Lighting.—Referring to the paragraph on this subject which appeared last week (p. 42), we learn that Dr. Auer von Welsbach has taken out a French patent (No. 337,320, Oct. 30, 1903) for their manufacture. In connection with this subject, it may be mentioned that two German investigators (Dr. and Herr J. Killing) have been testing a self-lighting or igniting mantle of their manufacture; and the results of extended trials are reported to be of a satisfactory character.

Natural Gas for Boiler Firing.—Burners for natural gas have been installed in the boilers of the power station for the Indiana Northern Traction Company at La Fontaine (Ind.). They are guaranteed to develop 1-horse power at 50 per cent. overload with 46 cubic feet of gas at 0·5 oz. pressure—a horse power in this connection being considered the evaporation of 34·5 lbs. of water from and at 212° Fahr. The boiler-room contains three Stirling water-tube boilers, each of 300-horse power, and supplied with twelve Claybourne burners.

High-Pressure Gas.—Probably the highest pressure ever shown by a natural gas well was at one in Nineveh, Pennsylvania. The well struck the Campbell's Run oil sand, and though the volume of gas was comparatively small, the rock pressure finally exceeded the limit of the gauge—1500 lbs. per square inch—and blew off the 2-inch pipe by which the well was shut in. As this pipe was supposed to be tested to 2000 lbs. per square inch, the ultimate pressure shown by the gas was probably not less than 1600 lbs. The highest pressure now recorded in West Virginia is at a well in Lewis County—1125 lbs. to the inch.

Spent Lime as an Anti-Parasitic.—It appears from the "Comptes Rendus" that M. Garrigou has employed powdered calcium sulphide with great success for the destruction of blights and parasitic weeds among vegetables, fodder, and garden plants. For the "dodder weed" in fields of lucerne, calcium sulphide is stated to be superior to any other destructive agent, and gets rid of the weeds in 48 hours. It kills insects on beans, peas, and rose trees. In order to ensure its full activity, it is necessary either that the weather should be damp, or that the powder should be moistened after it has been applied, thereby liberating sulphuretted hydrogen.

Utilization of Coke-Oven Gases.—The economic utilization of coke-oven gases for the heating of coke-ovens and steam-boilers, driving gas-engines, and the supply of illuminating, heating, and power gas, is described by Ziebarth in the "Zeitschrift des Oberschlesischen Vereins," 1904. We learn from "Engineering" that an exhaustive article has been published by Baum in the "Glückhauf," Vol. XL., pp. 84 to 86, and pp. 417 to 430) on the utilization of coke-oven gases for driving gas-engines. Compared with the installations for using blast-furnace waste gases as motive power, the number of installations for the direct production of power from coke-oven gas is small. The oldest is the 12-horse power motor at the Altenwald Coke-Works. The installations of importance are of quite recent date. Particulars are given of motors, aggregating 4860-horse power, driven by coke-oven gas.

The Late Mr. Willey.—Preaching on Sunday week in Exeter Cathedral, which was attended by Mrs. Willey and the family, as well as by other relatives of the late Mr. H. A. Willey, the Dean (the Bishop of Marlborough) paid a high tribute to the deceased gentleman. Dwelling upon the virtue of neighbourliness in various fields—in the home, in the workshop, in civic life, in the Church, and in business—he said that in Mr. Willey they had lost one who exemplified such neighbourliness. He had his faults—no one knew it better than himself. But if he had faults, he had excellences which they might all well strive to follow. They in Exeter knew what he was to his workmen—his care for them, their households, their homes, and his constant thought for their wider education. His Grace reminded his hearers of Mr. Willey's many benefactions, and concluded by saying that such lives as his, whatever their faults and their weaknesses might be, were not lives to be discounted, to be thought lightly of, or to be misunderstood. It was a life that did very much in that city to raise, develop, enlarge, and beautify their thoughts of what true neighbourliness should be.

REGISTER OF PATENTS.

Hydraulic Mains.—Helps, G., of Nuneaton. No. 19,706; Sept. 14, 1903.

This invention relates to the sealing or unsealing, to any extent, of the dip-pipes in gas-works, or of chambers which take the place of dip-pipes, by the application of a displacing vessel, which causes the sealing liquid to rise and close (by a predetermined seal) the connection between the dip-pipes and the hydraulic main or the dip-chambers or other like apparatus.

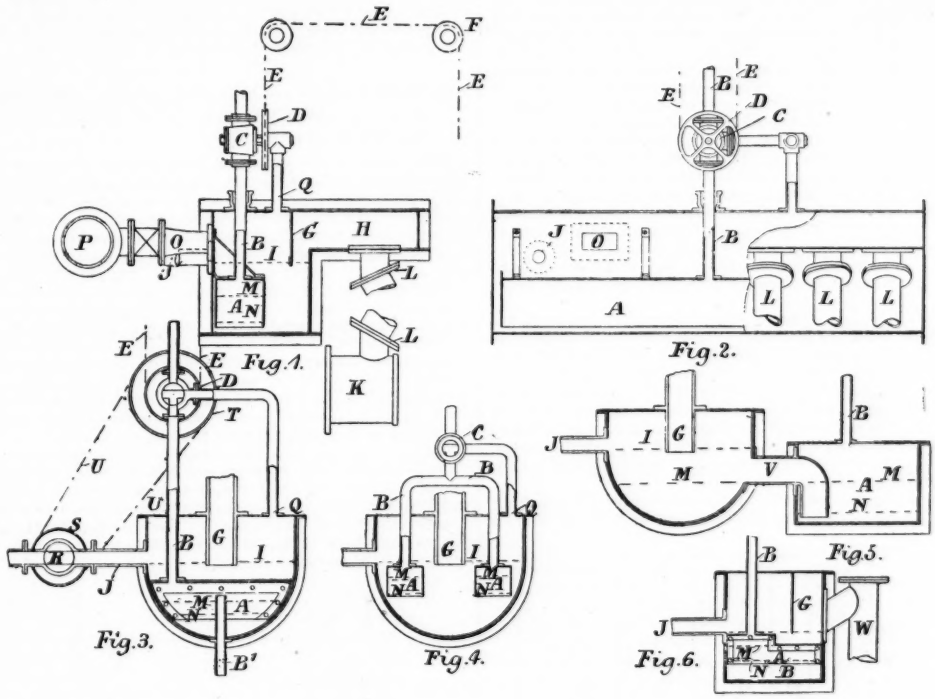
A displacing chamber is fixed inside, or adjacent to, the hydraulic main, having one or more connections to the tar and liquor in the hydraulic main, the level of which is (under normal conditions) the same in the displacing chamber as in the main, and is so adjusted as to be quite free from the lower ends of the dip-pipes or dip-feather and so that the gas entering the hydraulic main has a clear way to the foul-main and other apparatus.

Fig. 1 shows a section of a special hydraulic main and connections. A is the displacing chamber; B, the pipe conveying high-pressure gas or air to the displacing chamber through the three-way valve C; and D, a wheel or quadrant over which a chain E passes to work the valve, and which may be conducted over friction rollers F and dropped in any desired position for handiness. G is a web or dip plate which seals the dip-chamber H in the liquid at the lever I; the excess of liquid overflowing at the overflow J. The retort mouthpiece is shown at K, and mitred ascension pipe connections at L.

The effect of admitting gas under pressure to the chamber A is to displace the liquid it contains (say) from the level M to the level N or other predetermined line, and raise the level in the outer vessel until it seals the dip-plate G by the amount of the difference between the level of the bottom of such dip-plate and the overflow J. The gas-outlet is at O; and thus no gas can pass from the dip-chamber H to the gas-outlet without overcoming the seal, nor can gas from the foul main P pass back into the dip-chamber H. When, however, it is desired to have a clear way between the chamber H and the outlet O, the valve is so actuated as to connect the displacing chamber A with the hydraulic main at Q, which (by equalizing the pressures at the two points) allows the liquid in the hydraulic main to re-enter the displacing chamber. The dip-plate G is then unsealed, and thus is created the free-way desired. The displacing chamber and the hydraulic main are so proportioned as to provide for the tar and liquor made between the charges. When the seal is put on, the surplus rises and escapes at the overflow J.

Fig. 2 shows a part section and part elevation of fig. 1. A is the displacing chamber; B, the high-pressure gas supply; C, the valve; D, the valve wheel; E, the chain; J, the overflow; L, the mitred ascension pipes; and O, the gas-outlet.

Fig. 3 shows a section of an ordinary hydraulic main with the invention applied. A is the displacing chamber. B is the high-pressure pipe connected to the top of the chamber; and B^1, a pipe for the same purpose fixed to the bottom of the displacing chamber. D is the wheel on the spindle of the valve; and E the chain passing over same. G is the dip-pipe; I, the level of liquid in the hydraulic main when the dip-pipe is sealed; and J, the overflow. M and N are the levels of liquid in the displacing chamber when the dip-pipe is unsealed or



sealed. The displacing chamber and hydraulic main are connected at Q by a movement of the three-way valve. R is a valve on the overflow; S a pulley on the spindle of same; T the pulley on the three-way valve; and U, a chain connecting the two valve pulleys by which the overflow can be adjusted.

Fig. 4 shows a section of an ordinary hydraulic main with two displacing chambers; the description already given applying to the various portions of this arrangement.

Fig. 5 shows an arrangement where a separate displacing chamber is used. The description previously given also applies to this; V being the connection between the chamber and the main.

Fig. 6 shows a section of a special hydraulic main somewhat similar to fig. 1, but suitable for smaller mains. The description previously given applies equally to this; W being another kind of ascension pipe.

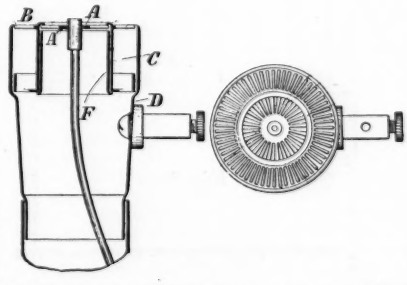
Atmospheric Gas-Burners.—Heslop, J. J. S., of Sunderland. No. 24,726; Nov. 13, 1903.

This invention relates to atmospheric gas-burners chiefly designed for use in connection with the coffee-roasting apparatus described in patent No. 9508 of 1898; the object being "to provide a burner which will not light-back when turned low, and in which the flames will be less liable to be interfered with by currents of air than is the case with burners as at present constructed."

The gas-nozzle, instead of projecting into a chamber provided with apertures through which air is drawn by the inductive action of the gas-jet, projects into a chamber into which air is forced under pressure, so that the flow of air to the burner is practically constant, whether the gas is turned fully on or more or less shut off. With this arrangement, the gas-flame will always issue from the burner in a more or less powerful jet or jets, and, consequently, be less liable to be acted upon by draughts than when burning with low pressure behind it.

Gas-Burners.—Francis, A. S., of Farringdon Road, E.C. No. 24,491; Nov. 11, 1903.

In incandescent gas-burners, the patentee proposes to employ, in place of the usual wire gauze (above which the mixture of gas and air is ignited), a device consisting of a number of bars with longitudinal spaces between them; the bars being preferably arranged in a radial direction (like the spokes of a wheel); and as the bars when so arranged would, if one set only of such bars extended from the centre to the periphery, leave larger spaces between the bars than is desirable, the device is made in two or more parts, one at the centre, and another (or others) in the form of an annulus surrounding the central portion, and filling up the space between the central part and the periphery. This arrangement allows of a greater number of bars being used in the outer, or annular, part or parts than in the central part; and, consequently, the spaces are limited as required.



The device (as shown) consists of a central part A with radially arranged bars with spaces between them. This central part is surrounded by an annulus B, with radially arranged bars with spaces between them. The parts A and B are held in position as illustrated; the part B being formed on, or brazed to, the tube C provided with a

ring to fit into the tube D of the burner. The part A is confined between a bent-over part of the tube C and a ledge inside the tube or a tube F brazed to the tube C.

Constructing Gas-Retorts.—Gielis, H., of Berlin. No. 24,068; Nov. 5, 1903.

This invention relates to the construction of gas-retorts which can be used in either a vertical or horizontal position.

The patentee points out that gas-retorts of the usual cross sectional shape, with straight or outwardly curved walls, have various disadvantages—they offer comparatively small resistance to internal pressure, more particularly if they are insufficiently or unequally supported, so that their walls easily bulge or bend; and, moreover, they can only be filled to a certain height, so that their capacity can only be utilized to a limited extent.

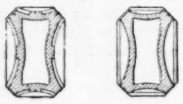
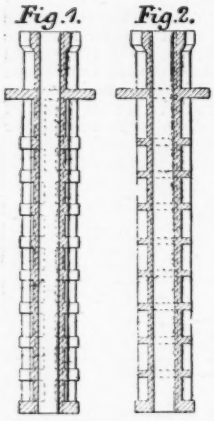


Fig. 1. Fig. 2.



To remove these disadvantages, he proposes to construct a retort so that "its capacity can be utilized to the fullest possible extent, and that the coal is gasified in thin layers in order to improve the quality of the gas—the retort being given the necessary strength to resist internal pressure without undue thickness of the walls," by forming it of four inwardly curved walls which make "pillars at the corners of the retort."

Figs. 1 and 2 show a cross section and a longitudinal section of two forms of retort. Fig. 3 is a vertical longitudinal section of a retort-furnace with vertical retorts. Figs. 4 and 5 are a cross section and a longitudinal section of a furnace with horizontally arranged retorts.

In figs. 1 and 2, all four walls of the retort are inwardly curved in cross-section, so that at the corners the adjacent walls form diagonally projecting pillars. The comparatively thin, inwardly curved walls between the thicker pillars "resist the pressure of the coal and gas in the manner of arches, and can consequently be thinner than the straight or outwardly curved walls of the usual gas-retorts."

In the form of retort shown in fig. 1, which is especially suitable for vertical use, all four walls are provided at intervals with longitudinal and cross ribs for strengthening the structure. As shown in fig. 3, if the retort is used in a vertical position, it is so placed on the lower part of the furnace that it is perfectly free and that the corner parts serve as supporting pillars. Between a number of rows of retorts placed side by side, and between the retorts and the vertical walls of the furnace, horizontal abutment plates H can be arranged to support the retorts laterally, and to form at the same time flues I for the fire gases, which pass round the retorts on all sides.

If the retorts are to be used in horizontal positions, the strengthening ribs are similar in shape to the cross section of the recesses formed by

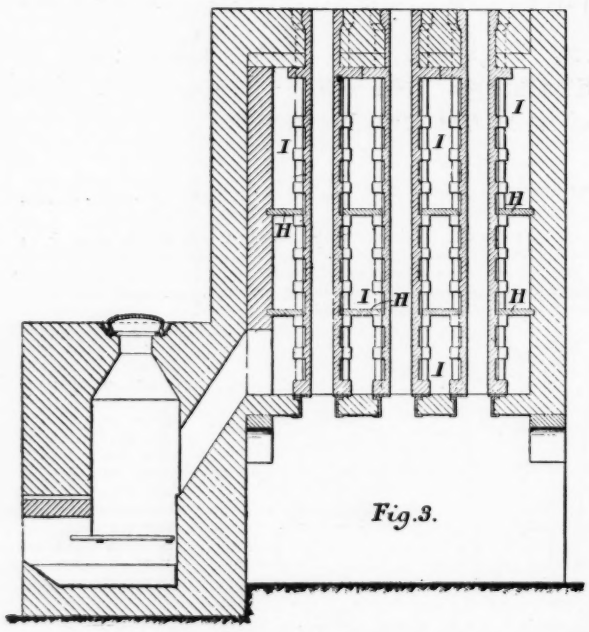
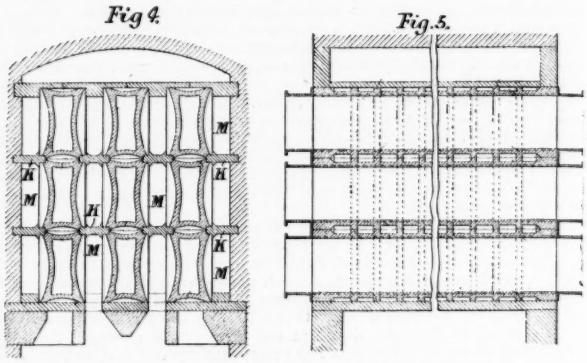


Fig. 3.

the inwardly curved walls, so as to nearly or entirely fill the concavities of the lateral walls—see fig. 2.

When the retorts are placed horizontally one above the other, as in figs. 4 and 5, the lateral ribs, extending through the entire height of the retorts, form vertical supporting pillars, and the ribs on the upper and under sides of the retorts, extending through the whole breadth of the structure, also form (together with lateral horizontal abutment plates K) supports for the retorts, and take up the horizontal strains. The ribs and the lateral surfaces of the retorts form, in connection with the lateral abutment plates (which are arranged between the rows of retorts and between the outer rows of retorts and the wall of the furnace), the walls for the horizontal heating flues M. "In such case, the flues or

Fig. 4. Fig. 5.



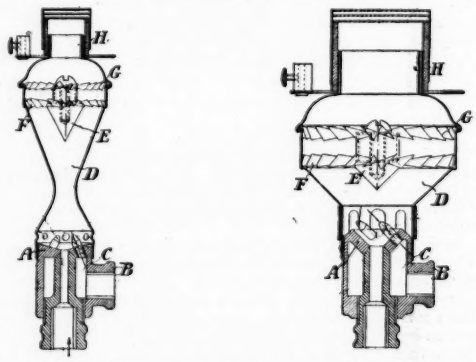
channels for the fire gases are arranged in such a manner that the gases have to travel through the longest possible distance to the outlet, in order to utilize their heating power to the greatest extent. The radiated heat easily passes through the thin walls of the retort and the comparatively thin coal layers between them; and this is of great advantage for the efficient reduction of the coal."

Gas-Burners.—Alliance Industrielle Société Anonyme, of Brussels. No. 9685; April 27, 1904. Date claimed under International Convention, May 5, 1903.

The object of this invention is to provide a burner in which compressed air is utilized for carrying away gas and a sufficient volume of air to the burner top, so as to obtain the highest calorific intensity, and preserve to the burning mixture at the outlet "a sufficient pressure to give the flame a certain horizontal expansion for the purpose of bringing the mantle or other body to complete incandescence." A further object is to provide means by which the quantity of compressed air introduced into the burner is approximately equivalent in volume to the quantity of lighting gas utilized; the supplemental amount required for the complete combustion of the gas being taken from the outer air.

The forms of burners shown comprise a lower device for the inlet of compressed air and gas and for carrying away atmospheric air; a central mixing-chamber having a narrow lower portion and a flaring upper portion; an inverted cone for the purpose of dividing the mixture; two horizontally arranged stationary helices having oppositely arranged vanes; and a burner proper.

The central gas-inlet has an upper flaring mouth A. B indicates a lateral tubular stud, through which compressed air is passed into an annulus C, and thence through nozzles into the mixing-chamber D; while atmospheric air is sucked into the chamber through apertures at the bottom part of the chamber. The nozzles are inclined and arranged in such manner as to produce a whirling movement in the narrow portion of the chamber D—resulting in an intimate mixture of gas and



atmospheric air carried away by the suction of compressed air. This intimate mixture is thrown upwardly and expanded in the upper flaring portion of the chamber D, and also divided by the inverted cone E. The divided mixture then engages the lower surface of the helix F carried by the cone, which also carries a second upper helix G the vanes of which are arranged oppositely to those of the lower helix "for the purpose of obtaining an absolutely intimate mixture of air and gas."

The vanes of the upper helix are twisted so as to preserve to the gas mixture its whirling movement within the burner H, whence it escapes through the perforated metal or wire gauze at the top with sufficient pressure to expand the produced flame horizontally beyond the walls of the incandescent mantle of the burner; "such expansion being required for obtaining a complete incandescence."

The first device shown is preferably used with air under high pressure. When air under lower pressure only is available, the mixing-chamber D is to be shortened, as in the second form, and the helices F G are arranged directly above the small nozzles.

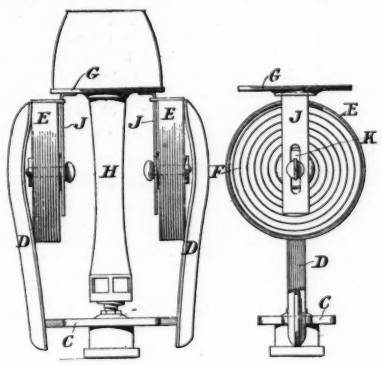
It is found that the highest efficiency is obtained with this burner when the compressed air is introduced at about 0·5 atmosphere pressure, and approximately equal volumes of gas and compressed air are utilized (the latter being reduced to atmospheric pressure), and four

times more atmospheric air will be sucked into the burner and mixed with the gas. Thus at the outlet of the burner-top there is obtained an intimate mixture of one part of lighting gas and five parts of air; and the mixture has at the outlet a sufficient pressure for expanding the produced flame horizontally for the purpose described.

Anti-Vibration Burners for Incandescent Gas-Lighting.—Sugg, W. T., of Regency Street, Westminster. No. 17,353; Aug. 9, 1904.

To support the burner used in incandescent gas lighting (with a view to prevent the fracture of the mantles in public lamps, due to the vibration caused by the traffic), the patentee proposes the arrangement shown.

To the gas-supply pipe the nozzle of a bunsen burner is attached as usual, and to the pipe or nozzle or other convenient part is secured a platform or gallery C, carrying standards D, which support boxes E, containing flexible connections F, such as volute springs, to which an



adjustable platform G carrying the mixing-tube H with the burner proper is attached. The platform G has downwardly projecting legs J with slots K, through which thumb screws L project to clamp the legs J to springs F. Or the connection may be made in any other convenient manner, so that the height of the platform G may be adjusted as desired. The mixing-tube H is provided with means to maintain the lower opening concentric with the gas-nozzle—such as a light spring.

APPLICATIONS FOR LETTERS PATENT.

20,636.—Richardson, S. T., and Price, R., "Prepayment Meters." Sept. 26.
20,655.—Pye, T. E., "Regulators for exhausters." Sept. 26.
20,674.—Jones, E. C., "Gas burning appliances." Sept. 26.
20,701.—Stromborg, F. O., "Regenerative furnaces." Sept. 26.
20,731.—Butterfield, J. B., "Taps for water or gas." Sept. 27.
20,747.—Ashworth, H., "Gas fire-lighter." Sept. 27.
20,778.—Head, W. G., "Gas cooking appliances." Sept. 27.
20,784.—The Chalk Power Gas Syndicate, Ltd., and Pearson, R., "Production of fuel gas and lime." Sept. 27.
20,824.—Taylor, A., "Incandescent burners." Sept. 28.
20,831.—Walker, E., "Acetylene lamps." Sept. 28.
20,845.—Wilson, L., "Gas-producers." Sept. 28.
20,854.—Partington, G., "Mantle support." Sept. 28.
20,862.—Turner, S. N., "Incandescent gas-lights." Sept. 28.
20,870.—Koppers, H., "Obtaining bye-products in the dry distillation or gasification of fuel." Sept. 28.
20,873.—Graydon, J. W., "Gas-engines." Sept. 28.
20,886.—Bellis and Morcom, Ltd., and Jude, A., "Turbines operated by expansive fluids." Sept. 28.
20,908.—Mills, H., "Anti-vibrators." Sept. 29.
20,916.—Smith, T. B., and The Sunlight and Safety Lamp Company, Ltd., "Incandescent gas-burners." Sept. 29.
20,944.—Zschocke, G., "Scrubbers." Sept. 29.
20,953.—Candi, O. & C., "Igniting and extinguishing gas-burners." Sept. 29.
20,998.—Everingham, J. H., and Partington, W., "Gas-chimneys." Sept. 29.
21,007.—Burley, J. D. C., and Gilmore, A. E., "Anti-vibrators." Sept. 30.
21,033.—Webber, W. H. Y., "Decorative gas illumination." Sept. 30.
21,058.—Billington, J. R., and Hall, W., "Lighting automatically burners, cookers, and fires." Oct. 1.
21,130.—Whitehouse, E., and The Cannon Iron Foundries, Ltd., "Heating irons applicable to gas-stoves." Oct. 1.
21,141.—The British Thomson-Houston Company, Ltd., and Holden, F., "Prepayment meters." Oct. 1.

Successful Dealing with the Naphthalene Trouble at Leamington.—Twelve months ago, Mr. J. Ferguson Bell's process for dealing with the naphthalene trouble, as in use in his works at Derby, was adopted by the Leamington Priors Gas Company; and we learn from Mr. Thomas Berridge, the Engineer and Secretary, that it has proved a complete cure.

Brisbane Gas Company.—The report presented at the last half-yearly meeting of this Company showed a net amount of £12,186 standing to the credit of the profit and loss account on June 30, including the balance from the previous half year. A dividend of 5 per cent. was paid, absorbing £7000; a bonus of 9d. per share took £1050; and the dividend tax £402 10s.—making together £8452 10s., and leaving £3733 to be carried forward.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Merits of Carburetted Water Gas.

Sir,—Will you allow me to reply, as briefly as I can, to the letter from Mr. Paddon which appeared in your last issue?

The question which was raised in the article to which he alludes—as to the liability to variation of the illuminating effect of incandescent lighting where a mixture of coal and carburetted water gas is used—does not seem to me to be satisfactorily disposed of by reference to the general effect of this or that piece of lighting. The liability exists, however much it may be minimized by careful regulation of the mixture, which is by no means always possible.

As to the calorific value of such mixture, I need only refer Mr. Paddon, for an illustration of my meaning, to Mr. Boys' supplementary evidence given before the Board of Trade Committee on Metropolitan Gas Testing (*vide* report, pp. 201-4), which was commented upon in the "Journal" for Aug. 2 last. This showed that the all-coal gas supplied by the South Metropolitan Company had a calorific value of 41·6 B.T.U. per candle, as compared with 39·3 B.T.U. in the case of the mixtures supplied by the other two Metropolitan Companies—a difference in favour of the former of between 5 and 6 per cent. It also seems to point to a much greater difference between the calorific values of all coal and all carburetted water gas of equal illuminating power, than has been stated by the authority quoted by Mr. Paddon.

Mr. Paddon thinks that because the price of coal has remained practically stationary during the last six months, while that of coke has only recently given way, therefore the argument that the value of coke is to a great extent dependent upon that of coal is destroyed. This is not so. He does not seem to know that this is by no means the first time in the history of the subject that the value of coke has not immediately followed that of coal, either up or down. In the long run, however, it does so, as stated in the article. It may this time have been longer in following than usual; but the inevitable drop has come at last. This was, indeed, foreshadowed by the heavy stocks held by the two principal Metropolitan Companies on June 30. These, with the corresponding figures of last year, were as follows:—

	Gaslight and Coke. Tons of Coke.	South Metropolitan. Tons of Coke.
June 30, 1904	40,880	20,565
,, 1903	6,294	5,706
Increase . .	34,586	14,859

The year's production for sale of these two Companies respectively was in the proportion of (roughly) 8 to 5; so that the above figures show a very disproportionate increase of stock by the Gaslight and Coke Company, notwithstanding their carburetted water-gas manufacture. They do not, consequently, support the idea suggested by Mr. Paddon, that the present downward movement is to be attributed to the action of the South Metropolitan Gas Company.

Mr. Paddon accuses me of having, by bringing the whole national supply into the question, attempted to obscure the issue with regard to the price of coal. I assure him that nothing was further from my thoughts. I did but seek to elucidate the subject according to my comprehension of it. He traverses my statement that "gas coal is not a thing apart;" but he says, a little further on, that, though every coal is not suitable for gas making, gas coal may be, and is, used for other purposes. That is exactly my point. Gas coal is used for a variety of industrial purposes besides gas making; and therefore it is not a thing apart, but its price depends upon the demand for the time being for all kinds of coal. No one can reasonably say that the extraordinary rise in the price of gas coal in 1872-3, or the smaller one of 1900, was due to an abnormal demand for coal for gas-making purposes. Both were the effect of good trade, which required for a period an extra supply of coal chiefly for manufacturing purposes. Nor can the depressed condition of the gas-coal market this year be attributed to any falling off in the demand for gas making; this being, on the contrary, greater than ever.

On the all-important question of economy, Mr. Paddon is content to say that Mr. Broadberry has shown "that a vast economic improvement may be effected in the affairs of a gas company without the whole benefit attaching thereto appearing in the revenue account." A vast economic improvement! Surely this is beating a very big drum! Can an exceptionally heavy and continuous expenditure upon wear and tear without any corresponding diminution in the capital account be rightly described as "a vast economic improvement?" But there is no need for me to pursue this part of the subject.

On the next and last point in Mr. Paddon's letter to which I need refer, he and I are almost at one. He says "that to reach any accurate conclusion in the matter, it would be necessary to establish, not only the financial position of gas companies using carburetted water gas in comparison with a period in which they did not use it, but also to realize what the comparison would be if they had not used carburetted water gas at all." This raises a difficulty, no doubt; but can it not be got over by including in the comparison some other company not using carburetted water gas, and under no suspicion of indifferent management? Such a company would be the South Metropolitan Company. Or, to go further afield, why not compare Glasgow with Liverpool, or Sheffield with Birmingham?

The Writer of the Article
Oct. 6, 1904. on "The Merits of Carburetted Water Gas."

Sir,—It has occurred to me that a few facts in connection with "The Merits of Carburetted Water Gas" might be of interest at the present stage of the discussion. I, of course, only refer to results obtained here. At the same time I feel bound to give credit where credit is

due, and to say a few words for a plant which has done so much for my Company and the consumers.

1. In 1900 and 1901 the cost of coal under contract increased 42 per cent.; whereas, owing to the introduction of water gas, we only increased the price of gas 15 per cent.
2. Before the introduction of water gas, we offered coke at 7s. per ton f.o.b., but failed to sell it at that price; at the present time we receive up to 27s. per ton on our works, and at some periods of the year have no stock on hand.
3. Complaints of stoppages, which used to be so numerous, have practically disappeared.
4. Considerable capital expenditure for storage plant has been avoided.

The argument has been used against water gas, that the oil market is very uncertain, and that there may in the future be difficulty in procuring oil. Against this, allow me to say that we have covered ourselves at a very low figure for our full requirements for oil up to the end of 1906. It would be interesting to know if any gas undertaking in the United Kingdom has been able to do this with regard to coal.

Alliance and Dublin Consumers' Gas Company, Oct. 8, 1904.

FRANCIS T. COTTON,
Secretary and Manager.

The Recent Gas Poisoning Case at Brighton.

SIR,—I was very sorry, on my return from a holiday, to read the article, on "A Question of Public Safety," in your issue of the 27th ult., as it exaggerates an exceptional incident.

The unfortunate fatality in Brighton to which you allude is an accident which occurs from time to time in the history of every gas company; and the comments you make upon it tend to seriously prejudice an important branch of the gas industry which, as one of our Press representatives, we look to you to protect.

The accident was entirely due to the action of one of the deceased persons. The result would have been the same if water gas had not been present, owing to the prolonged exposure of some 13½ hours; and this was the view adopted by the Jury.

An exceptional incident such as this can have little legitimate influence upon the question of the percentage of carbon monoxide in gas.

Hove, Brighton, Oct. 7, 1904.

JOSEPH CASH.

[Why Mr. Cash should be sorry to read the article to which he refers is not clear from his letter, as the comments he makes emphasize those contained in the article. The blame for the majority of these poisoning cases was thrown on defective fittings, and not imputed to the distribution of a mixture of coal gas and carburetted water gas. Instead, therefore, of the comments tending to "prejudice an important branch of the gas industry," they were calculated to protect it—for we recognized, and said: "With defective fittings, whether the gas be an admixture of two gases or a supply of pure coal gas, the chances are that the result would be the same in the event of a leakage during the night." It is impossible to see where, in this particular instance, Mr. Cash's views and our own are at variance. We also agree with Mr. Cash, through his use of the qualifying term "legitimate," in the view expressed in his final sentence: "An exceptional incident such as this can have little legitimate influence upon the question of the percentage of carbon monoxide in gas." Even so; but such incidents may have a good deal of influence that is not legitimate. It is through this that we say the makers of carburetted water gas should voluntarily practise restraint in respect of the proportion of carburetted water gas in the gas distributed. In this way, they will do much to protect "an important branch of the gas industry," which such cases as that at Brighton tend (perhaps through ignorance) to prejudice.—ED. J.G.L.]

Telescopic Rams for Pushing-out Coke from Retorts.

SIR,—With reference to the letters of Mr. W. J. Jenkins and Mr. John West in your issue of the 4th inst., I may inform your readers that my Board accepted the tender of Messrs. Jenkins and Co., Limited, of Retford, for a De Brouwer patent discharging machine on the 16th of December, 1903. This discharger is very similar to the one patented by Mr. West on the 26th of March, 1904, as reference to the description given in the paper read by me at the June meeting this year of the Institution of Gas Engineers will show.

The essential feature of the machine, which has now been in successful and regular use at our Cavendish Street works some four months, is a De Brouwer chain in combination with a telescopic ram, as clearly shown on the drawing accompanying my paper, and was so described by me.

Derby, Oct. 7, 1904.

J. FERGUSON BELL.

Hanover Retort-Charging Machinery.

SIR,—The principal reason for removing the Parisian charging machinery from these works has been the smoke which is inevitably produced when the charging machine is at work. Coal dust and air projected into a red-hot retort must produce a long flame and much smoke. This is of no consequence in gas-works situated in open fields; but as in Hanover the works are lying in the middle of the town, the neighbours began to complain.

The machines had been lent, in a most liberal way, by the Berlin Anhalt Machinenbau Actien Gesellschaft, specially for the purpose of exhibiting them to the engineers attending the German Gas Association meeting. We have worked with them for three months without disturbance, and replace them by West's machines because scoops evidently give the smallest amount of smoke possible.

Hanover Gas-Works, Oct. 7, 1904.

L. KÖRTING, Chief Engineer.

LEGAL INTELLIGENCE.

Exemplary Sentences for Stealing Gas and Fittings.

At the Middlesex Sessions on the 1st inst., William Chandler was charged with stealing a quantity of gas-fittings, the property of the Brentford Gas Company. Mr. W. H. Leycester (instructed by Messrs. Oswald Hanson and Co.) prosecuted for the Company. The facts were as follows: A police constable saw the prisoner and another man in Coronation Road, Ealing; and, upon following them, the prisoner dropped a parcel he was carrying, and both men ran away. The constable eventually arrested the prisoner; and, upon the parcel he had dropped being examined, it was found to contain fittings, the subject of the charge. Mr. Walter Green (Gas Inspector) was called, and identified the fittings as the property of the Company, and as having been removed from Twyford Cottage, Ealing, and stated that, as a consequence of the conduct of the prisoner, there was an escape of gas to the extent of 34,800 cubic feet. Witness stated that the Company suffered considerable loss by reason of the depredations of persons such as the prisoner. Upon these facts being proved, the prisoner was found "Guilty." The Judge (Mr. Montague Sharp) commented strongly on the prisoner's conduct, and stated that gas companies must be protected against such petty thefts, which involved considerable loss to them. He sentenced the prisoner to twelve calendar months' imprisonment, with hard labour.

On the same occasion George Otter was sentenced. This was a case heard at the Sessions in August last, when the prisoner was found guilty of the charge of stealing gas to the value of £8, the property of the Brentford Gas Company. Mr. W. H. Leycester appeared for the Company. The facts were as follows: The prisoner occupied No. 59, Clifton Gardens, Chiswick, where he had a cycle-repairing shop. In the shop, he had a brazing blowpipe and stove; and the premises were supplied with gas by the Brentford Company. On July 27 last, Mr. Walter Green, the Company's Inspector, called at the prisoner's house and found that a connection had been made between the main-pipe and the stove and blowpipe. After making a search Mr. Green discovered a bye-pass, by which the gas was passed from the main into the stove before it reached the meter. The prisoner was given into custody, and evidence was called at the trial to the effect that the prisoner had almost continually used the stove and blowpipe daily for the purposes of his trade for the past twelve months, and that during that time he had very seldom been seen to place money in the slot of the automatic meter fixed on the premises. The records of the Company's Inspector also showed that, according to the meter, only a very moderate amount of gas appeared to have been consumed in the house, whereas, from the evidence of a lodger, the gas consumed in the house must have been very considerable. Sir Ralph Littler, in passing sentence, stated that the prisoner had been guilty of a despicable fraud; and he committed him to twelve months' imprisonment, with hard labour.

Proposed Gas Purchase at Hessle.—The Hessle Urban Distric Council have decided to promote a Bill in Parliament authorizing the purchase of the undertaking of the Hessle Gas Company.

Reduction in Price at Ormskirk.—The Directors of the Ormskirk Gas Company have reduced the price of gas by 3d. per 1000 cubic feet; the reduction to take effect from the reading of the meters for the September quarter. This is the second reduction of 3d. made this year. The present price is 3s. net in Ormskirk, and 3s. 3d. net in the out-townships.

The Selby Water Scheme.—At last Wednesday's meeting of the Selby Urban District Council, the Gas and Water Committee recommended that Mr. Percy Griffith and Mr. Bruce Gray, the Council's Surveyor, be appointed Engineers for the new water-works. Mr. Bowe asked if it was necessary to have two Engineers. The work was all straightforward, and was to cost from £20,000 to £30,000. This meant £1500 for the Engineer. The Chairman said it would be a dangerous thing for them to undertake the work unless they appointed an Engineer. The scheme was of too serious a nature to leave to their Surveyor, who would not undertake the responsibility. The recommendation was adopted.

Use of Water for Gardens.—A report was presented at the meeting of the Torquay Town Council last Wednesday with reference to the effect of the decision to discontinue the supply of water for garden hose unless through a meter. Several consumers had given notice to discontinue the supply by hose, and others to cease the garden supply altogether; while a third section wrote claiming an allowance for the period from July 16 to September 29, when the use of hose was prohibited, though it had been paid for. The Water Committee recommended that consumers should be allowed the option of providing and fixing meters or of hiring them from the Corporation. It was stated by members of the Council that the discontinuance of the supply to hose-pipes had caused great dissatisfaction, and that the meter-rent was considered excessive. The matter was referred back to the Water Committee.

Woking District Gas Company, Limited.—At the ordinary general meeting of this Company yesterday, the Directors reported that the revenue for the year had been £6965, and the expenditure £5148; leaving a net profit of £1817 to be carried to profit and loss account, to which was added the balance brought forward. After charging interest on debentures and bank loan and income-tax, there remained an available balance of £1630, of which the interim dividend of 2½ per cent. to Dec. 31, 1903, absorbed £501. It was recommended that a final dividend of 4½ per cent. should be paid, making a total dividend for the year of 7 per cent., less income-tax, which would take £882, and leave a balance of £247 to be carried forward. The Directors expressed their pleasure in stating that the rental from private consumers for the year showed a satisfactory increase, which was continuing. There had been considerable demand for cooking-stoves, and a large number of consumers upon the penny-in-the-slot system had been connected.

MISCELLANEOUS NEWS.

EARL'S COURT GAS EXHIBITION.

Quick Cookery Competitions.

The conditions for the quick breakfast and lunch cooking competitions at the International Gas Exhibition have now been arranged. They will be held both afternoon and evening; and prizes and certificates of competency will be awarded. Regarding the conditions, the Committee will provide gas-stoves and all materials for the particular meal to be prepared, which will be laid out ready for cooking, in quantities sufficient for one person. The viands for each week will be the same throughout. The bills of fare will comprise, for breakfasts: Coffee, tea, cocoa, warm milk, porridge, rashers of bacon or fish, boiled or poached eggs, toast. For luncheons: Fried or grilled fish, cutlets, chops, steaks, omelettes, vegetables, toast, welsh rarebit. A supply of boiling-water will be provided for every stove. The competitions will start at a given time; the available places being first distributed by ballot. The winner will be the competitor who obtains the highest number of marks; the quality of the cooking and the time occupied in preparing the meal being taken into account. It must be understood that the chief object of these cookery competitions is to display the time and labour-saving merits of gas cooking-stoves, rather than the skill of the cooks in dressing the food in fancy ways. The entrance fee is 1s. for each event. The prizes will be awarded as follows: A first prize of £2, with first-class certificate of competency, will be awarded for the best performance each week in each competition, with 15s. for the second (with certificate), and 10s. for the third (with certificate). The Committee have prepared fuller printed particulars; and communications on the subject should be addressed to the Secretary of the Committee, Gas-Works, Waddon, Croydon.

We are asked by Messrs. George Glover and Co., Ltd., of Chelsea, to state that they will be exhibiting at Earl's Court, as also will be Messrs. George Newton and Co., Ltd., of Oldham. In addition to these firms and those named last week, we have received from Messrs. Bridges and Smith the following further list of intending exhibitors: The British Westinghouse Electric and Manufacturing Co., Ltd. The General Incandescent Co., Ltd., mantles, burners, &c. Messrs. Ewart and Son, Ltd., modern bath-room. Herr Carl Flugge. Messrs. W. J. Jenkins and Co., Ltd., gas engineers. The Nuneaton Gas Company. Herr Guiseppe Rocco, lighthouse system. The Rund Manufacturing Co., patent geysers. The Star Inverted Incandescent Burner Co., Ltd., miniature arc lamp, incandescent burners, and fittings. Messrs. Taylor and Co., fancy shades in silk, and mica chimneys. The United Kingdom Lighting Trust, Ltd., patent gas-reflectors.

QUESTION OF ILLUMINATING POWER AT NOTTINGHAM.

At the Meeting of the Nottingham City Council on Monday of last week, some discussion took place on the question of the price and quality of the gas.

Mr. GREEN, in accordance with notice, asked the Chairman of the Gas Committee (1) What reductions had been made during the last two years in the candle power of the gas supplied by the Committee, and on what dates; and (2) what reduction had been made in the prices charged during the same period, and on what dates? He added that, having regard to the report that had been placed in the hands of the Council (see last week's "JOURNAL," p. 48, and also below), he would like to supplement those questions with a third—Whether the Chairman of the Gas Committee would undertake to give the Council an opportunity of considering the report at an early date?

Mr. GREGG also asked: (1) If, seeing that gas was quoted at a minimum price of 1s. 6d. per 1000 cubic feet for power purposes, it could not be supplied to ordinary consumers at less than 2s. 6d., and still make an equivalent profit; and (2) if he did not think 3s. 4d. charged to slot-meter users an exorbitant price, and whether those consumers were not having to make up some of the loss entailed on the supply of gas for power purposes?

Mr. BYRON further questioned the Chairman of the Gas Committee as to whether he was aware of the many complaints respecting the very poor gas supply for lighting and other purposes, and whether anything was being done to remedy the very unsatisfactory service.

Alderman FORD, in reply to Mr. Green's questions, said that, acting on expert advice, the Gas Committee instructed the Engineer to reduce the power of the gas by 2 candles between February and April, 1903. Prior to that, the price charged was 2s. 10d. and 2s. 4d. per 1000 cubic feet, with an average selling price of 2s. 9d. But in March, 1903, it was reduced to 2s. 8d. and 1s. 6d., with an average selling price of 2s. 7d.; and in June, 1904, it was further reduced to 2s. 6d. and 1s. 6d., with an average selling price of 2s. 6d. As regarded the report referred to, he would be very glad to have it fully discussed on another occasion. With reference to Mr. Gregg's queries, the answer to that which concerned the possibility of gas being supplied to the ordinary consumer at less than 2s. 6d. was obvious. If it could be done, he was certain the Committee would do it. So far as the price charged to slot-meter users was concerned, the 3s. 4d. was 10d. above that which ordinary consumers had to pay. This was for interest on the service, rent of meters, collection, and other extras, and was not only the amount prescribed by the Board of Trade and recent parliamentary legislation, but actually cheaper than the ordinary price that such users had to pay. The small consumers were certainly not having to make up any loss on the low price charged to the large users. With regard to Mr. Byron's questions, he could assure the Council that it had not been a very pleasant office to be Chairman of the Gas Committee; for there had certainly been a great many complaints. But he was quite sure they were doing all they could to make matters better; and if they would only have patience, they would be perfectly satisfied in the end.

Alderman Sir JOHN TURNEY said he thought the reply very unsatisfactory. One thing he wanted to know was why the gas that was being made to-day could not be used on the lines of years ago; and the way to get at the bottom of this was not to have patience, but to have the whole question thoroughly thrashed out.

Sir George Livesey and Mr. J. H. Brown on Water Gas.

As indicated last week, the report above referred to contained correspondence which had taken place between the Gas Engineer (Mr. J. H. Brown) and Sir George Livesey and the Engineers of several gas undertakings, on the subject of the reduction of the illuminating power of gas. In a letter addressed to Sir George on the 6th ult., Mr. Brown made the following remarks on the advisability of employing water gas at Nottingham:—

Personally, I am convinced that the proper policy for Nottingham is to carry out your recommendations with regard to the reduction of the candle power and the carbonization of local coals. One great difficulty, however, immediately presents itself. In Nottingham there is practically no demand for coke; and when I state that 10 per cent. only of our total sales of coke are made in Nottingham, 12 to 14 per cent. is sold in Birmingham, 20 to 30 per cent. in London and the South Coast, and the remainder in Lincolnshire, Norfolk, Suffolk, and the surrounding districts, you will readily understand that the coke question at Nottingham is a very serious matter. This compels us to study our coke markets very carefully; and in order to maintain our sales in districts where we meet with very severe competition, we are compelled to make the quality of the coke its recommendation. We have, further, in our district a large quantity of cannel of only a moderate quality, and which produces a coke which is practically unsaleable, though it can be used in our retort-furnaces, and even there it is not very satisfactory.

These questions, as you will readily see, are of very vital importance to us as a gas undertaking; and if carburetted water gas could be said to be desirable at any works, one would think that Nottingham ought to be a suitable place. But, after carefully going into the questions of the cost of oil, the outlet it would open for a large quantity of our surplus coke, and after discussing the matter with carburetted water-gas plant makers, and also after carefully considering the so-called "collateral advantages" that are claimed for it, I came to the conclusion that it could not be adopted with any economic advantage on the Nottingham works.

While with the Ilford Gas Company, my Directors decided to adopt the Dellwik water-gas plant for use in conjunction with ordinary coal gas. There were very special reasons for the adoption of this plant. The Company had arrived at a point when it was necessary to abandon their old works, and to construct entirely new plant; and it was found that the Dellwik type was the only plant that could be erected on the old site. It was finally put down as an experiment to tide the undertaking over for a single winter; it being estimated that the saving in interest on the capital outlay on the new works for one season would be more than sufficient to pay for the cost of the water-gas plant. The results, however, were so satisfactory that they have continued the policy of supplying a mixed coal gas and blue water gas, enriched with benzol. At the time, I made many very successful experiments, and finally established a process for carburetting the water gas with ordinary Russian gas oil. These experiments resulted in the adoption of the carburetted water-gas plant as is at present used by a certain gas company, and which their Engineer states that he has brought to such perfection on his works.

These results at Ilford, my experience with blue water gas, Professor Vivian B. Lewes's experiments and statements, and our very serious difficulty in disposing of our surplus coke, have compelled us to very carefully consider the question of the advantageous use of blue water gas in conjunction with our coal-gas supply; and I have been for the past eighteen months carefully experimenting on a small scale at our Basford works, and some of the results are most striking. At Nottingham, we can obtain a bastard cannel which produces 10,000 cubic feet of 22-candle power gas. We are also buying a cannel which produces 9300 cubic feet of 29-candle power gas. The coke from these two cannels is practically useless in the ordinary way of working; but we can work them very satisfactorily indeed in our experimental water-gas plant, and can obtain something like 40,000 to 50,000 cubic feet of water gas per ton of coke. These results obviously point to the dilution of the 29-candle power cannel gas with the blue water gas made from the unsaleable coke, to produce a gas of about 580 B.T.U., at (say) 16½-candle power.

With these figures and facts before me, I then decided to make very careful experiments with what is known as the "Lewes process," in our experimental works, which are composed of three through beds of sevens, 18 feet long, 21 in. by 15 in. [Mr. Brown enclosed some of the figures obtained.] Unfortunately, owing to the small diameter and the great length of the ascension-pipes, and the very inefficient form of hydraulic mains, &c., considerable difficulty was experienced with the ascension-pipes blocking up when double the usual quantity of gas was being passed by one pipe.

The experiments, however, were very striking indeed in many of the results, and, in my opinion, have warranted further investigation. We find that, in direct contradiction of Professor Lewes's prediction, we invariably obtain a great increase in the production of tar, and a corresponding decrease in the quantity of ammonia. In many experiments, the production of cyanogen is doubled, and naphthalene practically entirely disappears. Our experiments, which extended over three months, were seriously interfered with by the type of bench ironwork (hydraulics and tar and gas mains, &c.); but I am now fitting new hydraulic mains, new ascension-pipes, and new mouthpieces to one side of these beds, and at an early date propose continuing these experiments.

To this Sir George Livesey replied on the 9th ult., by a letter in the course of which he said:—

As to water gas, it is very refreshing to find a man who can discuss it without losing his head, as so many do under the fascination it exerts, and who charge others with prejudice if they do not see eye to eye with them. You discuss the question rationally and intelligently, and your reasons and arguments appeal strongly to me. I dare say you noticed a sensible letter in this week's "JOURNAL," from Mr. Paddon, on the subject, pointing out the effect of the use of water gas on the coal and coke markets. I agree with him and with you, and have always contemplated the necessity of introducing water gas for such reasons of policy.

You do not want to enrich—of that I am in no doubt; but you do want to control your coke market, and for that purpose you need to do two things:

(1) To take care that all the coke you have to sell is of good quality, and if so you must not mix your coal; and (2) to reduce the quantity you have to put on the market. It seems to me the course you propose is the best—use the cannel you refer to for that purpose, and its coke for the water gas. I wish you success. . .

What I contend for in the use of water gas is that the mixture shall be uniform. The bunsen burners of gas-stoves, gas-fires, &c., have their air supply adapted to gas of a certain definite quality, usually ordinary coal gas. If a mixture of water gas is supplied, these burners can be adapted to it if it is constant in quality; but if it (the mixture) varies, as it generally does considerably, then they cannot have the proper supply of gas and air, and their efficiency, from the consumer's point of view, is seriously impaired.

USE OF WATER GAS AND OTHER GASES IN FACTORIES.

Home Office Memorandum on Carbonic Oxide Poisoning.

We have received from the Factory Department of the Home Office the following memorandum, signed by Dr. Arthur Whitelegge, C.B., Chief Inspector of Factories, on the use of water gas and other gases in industrial establishments.

In recent years there has been great extension of the manufacture and use of water gas and other gases of a similar nature (Dowson gas, Mond gas, power gas, producer gas, blast-furnace gas, &c.) for heating furnaces and boilers in factories, driving gas-engines, welding, and many other industrial purposes. The particular danger associated with all these gases is that of poisoning by carbonic oxide (carbon monoxide, CO), which is also a constituent of ordinary coal gas. But whereas the proportion in coal gas varies from 4 to 12 per cent., in carburetted water gas it reaches 30 per cent., and in uncarburetted water gas 50 per cent. The other gases named above usually contain from 10 to 25 per cent.

The use of these gases was the subject of an inquiry in 1899 by a Departmental Committee, who recommended in their report* that the manufacture and distribution for heating and lighting purposes of any poisonous gas which does not contain a distinct and pungent smell should be prohibited, and that regulations should be made limiting the proportion of carbonic oxide. In recent Acts authorizing companies and local authorities to manufacture and supply Mond or similar gas for motive or heating purposes, it is required that (1) the quantity of carbonic oxide in the gas shall be limited to 14 per cent., and that (2) the gas shall be strongly scented. It is made the duty of H.M. Inspectors of Factories to enforce these provisions as regards factories and workshops to which the gas is distributed.

The annual reports of the Factory Department during the five years 1899 to 1903 contain references to at least 51 cases (including 17 deaths) of poisoning by carbonic oxide on manufacturing premises; 43 being due to one or other of the gases named above. These casualties were traced to several causes, among which may be mentioned: (1) Leakage from joints or taps in pipes or flues conveying gas; (2) gradual escape of the gas into a confined atmosphere, as into a small engine-room or the syphon-pit of the Dowson apparatus; (3) cleaning of tanks or flues before a sufficient time had been allowed for the gas to escape; (4) underground situation of flues; (5) inodorous nature of the gas; (6) ignorance of the danger from the gas and of the earliest symptoms produced by it; (7) working alone; (8) lack of rescue appliances; (9) incomplete combustion of gas in defective gas ironing-machines.

Carbonic oxide poisoning may occur in other ways without inhalation of the particular gases named. Thus danger of this kind may arise in laundries from the use of gas-irons, and in workrooms from defective gas-fittings and from gas-stoves, especially when no provision is made for the products of combustion to be carried away by a flue or chimney. The absence of a chimney in a room greatly increases the risk. Carbonic oxide is found also in lime-kilns, cement-works, and where braziers and coke fires are used in confined spaces.

Symptoms of carbonic oxide poisoning begin with throbbing of the blood vessels of the head, giddiness, palpitation of the heart, weakness of the limbs. These become greatly aggravated after any exertion. Owing to their insidious onset and the cumulative effect of the gas, the weakness of the limbs may come on without attracting notice, so that the person affected is unable to make good his escape from the poisonous atmosphere. Headache, anæmia, and defective nutrition may result from the long-continued breathing of the gas in amount too small to produce immediate effects, such as might occur from defective gas-fittings in workrooms. The appropriate remedies for poisoning by carbonic oxide are fresh air, artificial respiration, administration of oxygen, and application of warmth.

Preventive Measures.—The precautionary measures to be considered must vary somewhat according to the different manner in which the gas is manufactured and used in one and another factory; but the following are of general application: (1) Notices should be posted up stating the deadly nature of the gas, the symptoms produced by its inhalation, and the best means of rendering aid to those who are "gassed." (2) Persons in charge of any engine worked by the gas, or of any apparatus in which it is stored, or otherwise exposed to risk of inhaling carbonic oxide, should be free from any disease of the heart or lungs. Employers would do well to cause such persons to be examined and certified by a medical man. (3) No engine in which the gas is used should be in a confined space. (4) A competent and responsible person should, at stated short intervals, inspect all valves and connections, to see that there is no escape of gas; and a signed record with the dates of such inspections should be kept. (5) The openings giving access to any part of the gas circuit should be few, and in positions as safe as possible, and opened only in cases of real need and by responsible persons. (6) No workman should enter, or approach when opened, the holder or other part of the gas circuit until the gas has been well flushed out by fresh air. (7) A cylinder of compressed oxygen, fitted with a piece of rubber gas-tubing and a mouthpiece, should be kept in constant readiness. Such cylinders can be obtained fitted also with a reducing-valve. (8) Medical aid should be summoned immediately; but in view of the importance of losing no time in commencing treatment, the workmen employed should be instructed by a medical man in the manner of administering the oxygen and of performing artificial respiration. They should be especially warned of the danger of exposing the patient to cold. Respirators are of no avail as a protection against carbonic oxide poisoning.

When, for purposes of rescue, it becomes necessary to enter an atmosphere charged with the gas, the rescuer must protect himself by tying a rope securely round his waist, the free end being held by persons outside, or preferably by the use of one or other of the special rescue appliances designed for such work. The principle underlying them is that the rescuer is made to breathe air, or a mixture of air and oxygen, which renders him independent of the poisonous atmosphere immediately surrounding him. Reference to such appliances, which are now kept in many chemical works, &c., will be found in the annual report of the Chief Inspector of Factories for the year 1895 (p. 47), and for the year 1896 (p. 31).

In towns where the public gas supply is largely charged with water gas, attention to gas-fittings in factories and workshops becomes a matter of increased moment.

The following notice, which has been drawn up by the Power Gas Corporation, Limited, in consultation with the Medical Inspector of Factories (Dr. T. M. Legge), to be posted up near the place where danger arises, may serve as a model for the notice referred to under the heading "Preventive Measures" (1).

Danger of Gassing.—Breathing of producer gas should be avoided. It is dangerous when breathed in quantity. The first symptoms produced by breathing the gas are giddiness, weakness in the legs, and palpitation of the heart. If a man feels these symptoms, he should at once move into fresh warm air, when in slight cases they will quickly disappear. Exposure to cold should be avoided, as it aggravates the symptoms. A man should not walk home too soon after recovery, as muscular exertion, when affected by the gas, is to be avoided. If a man should be found insensible, or seriously ill from the gas, he should at once be removed into fresh warm air, and immediate information be sent to the oxygen administrator, a medical man being sent for at the same time. No man should work alone on any work which would be likely to involve exposure to the gas. Should the nature of the work cause the man to enter a culvert or hole, he should have a rope tied securely round his waist, held at the other end by his mate outside.

Use of the Oxygen Cylinder.—The cylinder should be provided with a lever key, nipple, and union, together with a rubber tube at the end of which is a mouthpiece. It is also advisable to have a small pressure-gauge attached to the cylinder, so that loss of oxygen may be observed and the cylinder kept in working order. Open the valve gradually by tapping the lever key (fully extended) with the wrist until the oxygen flows in a gentle stream from the mouthpiece in the patient's mouth, and allow the oxygen to be breathed until relief is obtained. The lips should not be closed round the mouthpiece, as it is important to allow free egress for surplus oxygen. The nostrils should be closed during inspiration or inflation of the lungs, and opened during expiration or deflation of the lungs, so that the oygen may be inhaled as pure as possible through the mouth. If the teeth are set, close the lips and one nostril. Let the conical end of the mouthpiece slightly enter the other nostril during inspiration, and remove it for expiration.

Artificial Respiration.—Artificial respiration is sometimes necessary in addition to the oxygen inhalation, if the oxygen does not appear to act quickly. Place the patient on his back, slightly raising the shoulders with a folded coat. Remove everything tight about the chest and neck. Draw the tongue forward, and maintain it in that position. Grasp the arms just above the elbows, and draw them steadily above the head, keeping them on the stretch for two seconds, and then folding them and pressing them against the chest for the same length of time. Repeat these movements about 15 times a minute for at least half-an-hour, or until natural breathing has been initiated, when the oxygen inhalation alone will suffice. After recovery, oxygen inhalation at intervals should be continued as desired.

Further detail may be needed in connection with particular branches of industry. In consequence of the constant danger of carbonic oxide poisoning in cement-works, the Associated Portland Cement Manufacturers (1900), Limited, have adopted a special notice [reproduced in the memorandum], in addition to somewhat similar instructions to those given above.

Barnard Castle Gas Company.—The first (statutory) general meeting of this Company was held last Friday, in the Witham Testimonial, Barnard Castle. Mr. R. T. Richardson, the Chairman, presided, and shortly explained the purpose of the meeting, which was held in compliance with the provisions of the Act, which received the Royal Assent on the 24th of June. He congratulated the members on the successful accomplishment of their purpose of obtaining statutory authority, which placed the Company on a much more satisfactory footing. Mr. Chipchase complimented the Directors on the way in which they had brought the undertaking out of its difficulties, and placed it on a firm basis. The members owed a debt of gratitude to them for the way they had managed things. It was unanimously resolved that the former Directors (Messrs. R. T. Richardson, J. H. Dawson, W. J. Watson, J. Brownless, and J. A. York) be reappointed to act on behalf of the new Company. Mr. Richardson, in responding, thanked the members for their expression of confidence. He said economy and efficiency were their aim; and he regretted that they had been put to the expense of the Act of Parliament. He had looked forward at one time to getting the price of gas down to 2s. per 1000 cubic feet. No doubt they made a mistake in not raising the charge when coal was so dear, and thus their balance was lost. But for the action of the Council, the gas would have been 2s. The retiring Auditors (Messrs. T. & C. Chipchase) were re-elected. The Directors having been formally authorized to borrow on debentures the additional money required for paying the costs of the Act, it was unanimously resolved that the best thanks of the meeting be given to the Directors and the Secretary (Mr. Robert Wood) for the able manner in which they had carried out the promotion of the Act. A vote of thanks to the Chairman concluded the meeting.

* See "JOURNAL," Vol. LXXIII., p. 447.

THE LONDON COUNTY COUNCIL AND GAS TESTING.

Proposed Amendment of the Law.

At the Meeting of the London County Council to-day, the Public Control Committee will present the following report on the above-named subject.

The Council, on July 7, 1903, decided to promote legislation to obviate difficulties which had arisen from the Gas Companies appealing against the Council's Gas Examiners' report, and withdrawing the appeals after the expiration of one month, by which time it was too late for the Council to take proceedings. The Bill dealing with this matter was introduced in the session of 1904, but was withdrawn at the suggestion of the Board of Trade, who had in the meantime, in accordance with a request made by the Council, appointed a Departmental Committee to consider the subject. The reference to the Committee was "to inquire and report as to the statutory requirements relating to the illuminating power and purity of gas supplied by the Metropolitan Gas Companies, and as to the methods now adopted for testing the same, and whether any alteration is desirable in such requirements or methods, and, if so, whether any consequential alteration should be made in the standard price of gas."

This Departmental Committee very carefully considered the various matters relating to the testing of gas in London, and heard evidence thereon from the Metropolitan Gas Referees and from representatives of the Council, the Corporation of the City of London, and each of the Gas Companies concerned—namely, the Gaslight and Coke Company, the South Metropolitan Gas Company, and the Commercial Gas Company. The Committee have issued their report which contains recommendations as follows. [The recommendations, which have already been given in the "JOURNAL," are then set out in full.]

We think that these recommendations, with the exception of that marked (*f*) * may be considered acceptable to the Council and just to the consumer of gas; and we have therefore considered what steps should be taken to give effect thereto. We have been informed by the Board of Trade that His Majesty's Government have not yet had an opportunity of determining whether they will promote legislation on the subject; and the Board have suggested that, in the meantime, the Council should take such steps as may be necessary to put itself in a position to introduce a Bill for the purpose. We think it desirable, therefore, that, with the reservation hereafter referred to as regards recommendation (*f*), the Council should promote legislation in the next session of Parliament on the lines of the recommendations of the Board of Trade Committee. The evidence given on behalf of the Council before the Departmental Committee was opposed to that recommendation; and should it become law, the obligation placed upon the Gas Companies with regard to the removal of the sulphur impurities other than sulphuretted hydrogen will be abolished. We therefore suggest that it should be left to the Parliamentary Committee to consider, in conjunction with ourselves, how this question should be dealt with in any Bill promoted by the Council.

We also think that steps should be taken to obtain the powers dealing with appeals against Gas Examiners' reports referred to earlier in this report. These were briefly as follows: (1) To allow the Chief Gas Examiner to decide an appeal from the decision of a Gas Examiner in the absence of parties who do not attend before him after due notice. (2) To require the Company concerned and the Chief Gas Examiner to give the Council notice if an appeal which has been lodged is withdrawn. (3) To make the time within which proceedings for breaches of the Companies' Special Acts may be taken six months (*a*) from the date of the report of the Council's examiner, which is made daily or (*b*) from the date of the report of the Chief Gas Examiner if an appeal be lodged and decided, or (*c*) from the date of the withdrawal of any appeal lodged or withdrawn. (4) To repeal sections 7 to 12 inclusive, 25 to 34 inclusive, 37, 40, and 41 of the Metropolis Gas Act, 1860, which are obsolete.

In our opinion, steps should also be taken to put on a definite basis the minor matters which were referred to in the evidence before the Departmental Committee, but which were not the subject of recommendations, namely: (5) To make it clear that the Chief Gas Examiner can amend or modify as well as merely cancel or confirm a Gas Examiner's report on appeal. (6) To make better provision for the Chief Gas Examiner's reports being evidence in proceedings, without formal proof of his signature.

Our proposals, so far, principally relate to the testing of gas. Another matter, however, which should be considered is the standard price. The Departmental Committee do not deal with the subject by way of recommendation, but their report contains the following statement:

> The relaxation of the requirements with respect to sulphur purification will undoubtedly be a great relief to the Companies, to whom the existing tests cause great trouble and anxiety; but the Committee do not think that the pecuniary advantage is, in itself, sufficient to justify them in recommending any consequential reduction in the standard price of gas. The Committee suggest, however, that the removal of these onerous regulations would furnish an appropriate occasion for revising the present arrangements of the sliding-scale, and substituting for them arrangements in which the standard price and the rate of variation of dividend would be fixed so as to give the Gas Companies greater incentives to economy, while being equally favourable to the public under normal circumstances. In revising the arrangements, it would be well to bear in mind that the larger proportion of gas consumed is even now used for purposes for which the calorific value is the important point.

We entirely concur in the opinion above expressed, and think that steps should be taken in the direction indicated. The Council will no doubt remember that a new sliding-scale was, in 1903, arranged with the Gaslight and Coke Company; and as the Parliamentary Committee conducted the proceedings resulting in that arrangement, we think that Committee should frame such new proposals on the subject as they may think practicable.

As required by Standing Order No. 365, we have to state that we are advised that the Council has power to promote legislation in the direction indicated. We have also, as required by Standing Order No. 363, informed the Parliamentary Committee of our intention to submit to the Council proposals for legislation dealing with this subject.

We recommend—

(*a*) That the operation of the Standing Orders limiting the period for considering applications to Parliament be suspended so far as may be necessary to enable the following recommendation to be considered.

(*b*) That the necessary measures be taken for promoting, in the next session of Parliament, legislation for the amendment of the law relating to the testing of gas in the County of London, on the lines indicated in the recommendations of the Departmental Committee appointed by the Board of Trade, and for dealing with the following additional points: Appeals on Gas Examiners' reports, and the Chief Gas Examiner's powers relative thereto; the time within which legal proceedings may be taken; the amendment of a Gas Examiner's report by the Chief Gas Examiner, and the formal proof of the latter's signature to a report; and the repeal of certain obsolete sections of the Metropolis Gas Act, 1860.

(*c*) That the Parliamentary Committee do frame such proposals for a new sliding-scale arrangement as regards the price of gas in London as they may consider practicable.

* This recommendation runs as follows: "That the obligation placed upon the Companies with regard to the removal of the sulphur impurities (other than sulphuretted hydrogen) should be abolished, but that testing for information only should continue to be made in such manner and to such extent as may be prescribed by the Gas Referees."

NANTWICH GAS-WORKS TRANSFER.

On Saturday the 1st inst., the Nantwich Gas-Works were formally transferred from the Company to the Urban District Council. The Company were represented by the Chairman (Mr. T. Pickmere), Mr. H. Martin, a Director, the Secretary (Mr. E. J. Fussell), and the Parliamentary Agent (Mr. H. G. Pritchard); while there attended on behalf of the Council the Chairman (Mr. E. S. Haighton), the Chairman of the Gas Committee (Mr. C. E. Davenport), and the Clerk (Mr. A. E. Whittingham). A cheque for £69,363 2s. 2d. was handed to the Company, and the receipt was signed. On the completion of the formalities, the representatives of the Company retired leaving the Council in possession. The account presented on behalf of the Company amounted to £69,401 5s. 11d.; but on readjustment, items totalling £38 3s. 9d. were struck out. The corrected figures were as follows: Amount of award, £68,148; cost of Company's Bill, £250; apportionment of outgoings, insurance, &c., £9 13s. 11d.; capital expenditure for meters, &c., new main, £243 3s. 1d.; Company's taxed costs (arbitration), £712 5s. 2d.—total, £69,363 2s. 2d. At the fortnightly meeting of the Council on the previous day, minutes of the Gas Committee were submitted which stated that the services of Mr. E. J. Fussell, the Secretary, had been retained, and that they recommended the appointment of Mr. D. H. Davies as Manager, at a salary of £150 a year, with free gas. The Committee also recommended that an offer of £800 should be made to Mr. John Davies in settlement of his claim for compensation for the loss of his office as Manager. These minutes were confirmed; and it was further resolved to increase the Clerk's salary by £55 a year, so as to enable him to provide the extra assistance he would require on account of the additional duties that would devolve upon him in respect to the gas-works.

The Clerk reported that, in accordance with instructions, he had examined the deeds of the gas-works properties. The same had been purchased from 1869 to 1901, and consisted of ten lots of properties; the total amount of purchase money being £7267. They were property vested in the Gas Company; and the description and plans in the various conveyances corresponded with the site of the works. The buildings were insured for £10,000 with the Norwich Union Fire Office; the annual premium being £12. He recommended that the question of revising the policy which had been recently taken out be referred to the Gas and Lighting Committee. He remarked that it might be interesting to the Council to know that, through the old documents, it appeared that a site for a gas-works was purchased by William Smith, of Whitchurch, builder and gas proprietor, and Edward Jones, of the same place, liquor merchant, on May 12, 1832. The works were erected; and an award was made as to the price to be paid on Oct. 1, 1834—exactly the same day of the year on which the Council took over the works.

Subsequently it was agreed to apply to the Local Government Board for sanction to borrow £2000 for working capital for the gas undertaking.

CHARGE TO PREPAYMENT CONSUMERS IN LEEDS.

An amusing discussion took place in the Leeds City Council last week, when Mr. W. H. Clarke (who is one of the Conservative members retiring next month) moved: "That it be an instruction to the Gas Committee to make arrangements to sell to consumers of gas through penny-in-the-slot meters at the same rate as gas is sold to other consumers."

On rising, Mr. Clarke was greeted with loud shouts of laughter; and his statement that the resolution constituted one of the strongest planks in his personal platform, led to a question as to why he had not moved it before. He replied that it was because he had not been able to move Alderman Lowden (the Chairman of the Gas Committee) in the meantime. His friends, he said, could simulate merriment; but he assured them that there was a strong volume of public opinion in favour of the step he proposed. Ordinary consumers had some months' credit, and then if they paid within a month they obtained 5 per cent. discount; while they had the further advantage of getting their gas at 3d. per 1000 cubic feet less than the prepayment meter users. If the Council found it necessary to cater for the latter—unquestionably

the poorest in the city—they ought to do so on business lines, and sell gas to them at the same rate as to the rest of the citizens.

The resolution having been formally seconded, Alderman Lowden pointed out that shortly there would be a reduction of the whole of the gas charges; and a very great change would be effected when the Consolidation Bill became law. He urged that an immediate alteration was not absolutely necessary; for six or nine months hence they intended to reduce the price of gas both to ordinary gas consumers and to those using automatic meters. If the resolution was adopted, the change would at once involve the Committee in an additional expenditure of £1175. All managers of gas departments had realized that it was impossible to supply gas to the automatic meter consumer at the same price as to the ordinary consumer. Mr. Ratcliffe condemned the resolution as a vote-catching one. Mr. Clarke "had seen the writing on the wall, and was like a drowning man catching a straw." Last year, the Gas Committee sold no fewer than 5000 ordinary meters (the cost of which averaged 25s.) for 9d. each. If they made the price of gas to the automatic meter consumer the same as to the ordinary consumer, they would have thousands of people demanding that the old-fashioned meters should be taken out, and automatic ones put in. Were they prepared to take this step, and sell their old meters for 9d. each? If the resolution was adopted, they would have 30,000 or 40,000 meters thrown on their hands, and not worth a shilling. Mr. Beckworth, in supporting the resolution, said that if Mr. Clarke had been really sincere he would have voted against the estimates last June, which allocated £30,000 of profits from the gas undertaking towards the relief of the rates. So long as huge profits were made on the gas and other concerns, and taken wholesale to reduce the rates, he failed to see how the consumers, who really had the right to the benefit, were going to gain. Mr. Kinder remarked that he had never heard Mr. Clarke mention automatic meters once during the last three years. Personally, he should go further than the resolution, and say that the prepayment consumers should be charged less than the ordinary ones, because in their accounts there were no bad debts. The resolution would deceive nobody.

After a brief reply by Mr. Clarke, the motion was put and carried by 39 votes to 3.

THE DE BROUWER PROJECTOR AND COKE CONVEYOR.

The Darwen Town Council at their meeting last week adopted a recommendation that an installation of coal-handling plant, with a De Brouwer projector and pusher and hot-coke conveyor, should be made at the gas-works. The order for the plant and work consequently goes to Messrs. W. J. Jenkins and Co., Limited, of Retford. The projector appears to be gaining considerable favour; for, with this fresh adoption, no less than twenty contracts for installations have been executed or are in hand. The works where they have been or are being established are: Derby, Gaslight and Coke Company (Nine Elms), Bury, Nuneaton, Nottingham (two orders), Douglas, I. of M., Walsall, Lancaster, Reading (two machines), Salford, Otley, Stockton-on-Tees, Blackburn, Neath, Cambridge, Alloa, Commercial Gas Company (Stepney), Sunderland, and Darwen. The latest contracts entered into for the De Brouwer coke-conveyor are for the Liverpool Street station of the Salford Corporation (a repeat order), the Norwich works of the British Gaslight and Coke Company, the Tottenham and Edmonton Gas Company, the Fulham station of the Gaslight and Coke Company (third order), the Bromley station of the same Company (fourth order), and the Croydon Gas Company (third order).

According to a report to hand from Darwen, the installation of coal plant, projector and pusher, and coke plant is to cost between £4500 and £5000. In the course of the proceedings at the Council meeting, Alderman Carns advocated that the plant should be paid for out of revenue and by instalments extending over five years. Alderman Tomlinson expressed a preference for the cost being added to capital charges. However, the recommendation in favour of the instalments being paid out of revenue was approved.

COMPANY v. MUNICIPAL MANAGEMENT.

A Reply from Ossett.

In the "JOURNAL" for the 27th ult. (p. 894), there was published a letter on the subject of the proposed purchase of the Bishop's Stortford Gas-Works, which was addressed to the "Herts and Essex Observer" by Mr. P. S. Bridgeford, the Secretary of the Industrial Freedom League. One of the places specially referred to by the writer was Ossett; and the Chairman of the Gas Committee of the town (Mr. F. Audsley) therefore desired to put forward his own view of the matter. This he did in the accompanying letter, which, we understand, was refused insertion in the paper in which Mr. Bridgeford's communication originally appeared.

Sir,—Mr. P. S. Bridgeford's letter names the town of Ossett among the places he sets up as showing an annual loss on their gas undertaking. I therefore shall be much obliged if you will allow me a few words in reply to his letter.

The first town he gives as showing a loss is Workington; but Workington made a profit last year of £2074. I suppose he will say this was an oversight on his part. Then as to Ossett. As Chairman of the Gas Committee, I can tell him that last year we had a profit of £1132, after paying all charges. We have wiped off all deficits; and we have splendid results. Shipley and Glastonbury have (like ourselves) only recently purchased their works; and still Mr. Bridgeford quotes from an old return made up to March 31, 1903, figures which are eighteen months old. Your correspondent says that no municipal gas is sold as low in price as Sheffield—1s. 6d. to 1s. 10d. per 1000 cubic feet. I beg to remind him that Widnes sells gas at 1s. 3d. net per 1000 cubic feet, and for motive power at 1s. 1d. His letter is full of incorrect statements. There are 256 towns controlling their own gas supply. Only 14 of these towns show a loss for the year ending March 31, 1903 (Mr. Bridgeford's year). These 14 towns exhibited a loss of £6243. As a start against this, they paid sinking fund off to the tune of £19,488. They also give free meters to 54,284 consumers, at 2s. 6d. each per year, amounting to £6535. This gives a total of £26,023; and deducting the loss £6243, there is a clear gain even to the losers of £19,780.

According to Mr. Bridgeford's own return (which he quotes from), there are only 14 towns which show a loss, while the remainder (94 per cent.) make a net profit of £793,764. Deducting from this the loss of the 14 towns £6243, you have a net gain of £787,521, besides paying into sinking fund £600,000—showing a clear gain of £1,387,521 in favour of municipal gas ownership. There was over £3000 profit for each of the 256 towns which work their own gas undertaking and each paid over £2000 into the sinking fund; making a gain of over £5000 a year for each of the towns who have had the courage to acquire their own gas supply. Yet Mr. Bridgeford says "the profits are small."

Here at Ossett gas purchase has been a great success. Since we purchased (three years ago), our consumption of gas has increased as follows: 1904, 81 million cubic feet; 1901, 69 million cubic feet—showing an increase in three years of 12 million cubic feet.

BIRMINGHAM CORPORATION WATER SUPPLY.

Official Visit to the Frankley Reservoir.

On the invitation of the Water Committee of the Birmingham Corporation, the members of the City Council, the chief officials, and others, visited last Friday the Frankley reservoir and filter-beds, which complete the scheme for bringing to the city a supply of water from Wales, the principal portion of which, in the Elan Valley, was opened by their Majesties the King and Queen in July last, as recorded in the "JOURNAL" at the time. There was a very large party, which included the Mayor (Sir Hallewell Rogers), the Lady Mayoress, Alderman Lawley Parker (the Chairman of the Water Committee) and Mrs. Lawley Parker. Mr. E. Antony Lees (the Secretary to the Water Department), by whom all the arrangements were carried out, was also present. The guests assembled at the Council House, and were conveyed in carriages to the reservoir. On arriving, they were divided into four parties, which were conducted respectively by Mr. E. L. Mansergh, Mr. F. W. Macaulay (the Resident Engineer), Mr. Gray (the Distributing Engineer), and Mr. Lees. Each visitor had been furnished with a printed description of the works, prepared by the Engineers (Messrs. James Mansergh and Sons), from which the following particulars are taken.

The reservoir receives the water brought down by the aqueduct from the gathering-ground near Rhayader. It is semi-circular in plan, and when full has a water area of about 25 acres and a depth varying from 30 to 35 feet. It will contain 200 million gallons. It is constructed mainly of concrete and made water-tight by a skin of asphalte uncovered on the floor and protected by blue brick facing on the walls. The east straight wall is nearly one-third of a mile in length; and the distance all round the reservoir is a little more than four-fifths of a mile. It is divided into two equal portions by a wall running from the centre of the circle to the circumference, at which latter point the water is let into each or both divisions at will over a series of steps extending to the floor of the reservoir. After leaving the aqueduct, and just before entering the inlet basin, the water passes through a gauge-chamber, in which the quantity flowing is measured and recorded by means of an instrument installed for the purpose in a small building on the west side of the reservoir immediately behind the inlet. From the gauge-chamber the water flows into the inlet basin, where it is controlled by sluices and passed into either or both divisions of the reservoir, or is diverted to the right or to the left round the reservoir to the outlet-valve wells, which are situated below domed buildings on its north-west and south-west sides. These buildings contain the requisite machinery for regulating the quantity of water allowed to enter the outlet well from the reservoir, the direct mains from the inlet basin, or the mains leading therefrom to the filters. Below the reservoir, 18 filter-beds, having a combined area of about 14 acres, have been constructed, competent to deal with the quantity of water which the two mains comprising the first instalment of the scheme are capable of bringing down the aqueduct; and there is ample room on the site for the addition of other filter-beds when further mains are laid and the necessity arises.

After leaving the filter-beds, the water is collected into a covered pure-water tank having a capacity of 500,000 gallons, near the pumping-station, from which the several distributing mains are fed; and on the east side of the tank there is a chamber containing the valves, &c., which control the quantities of water allowed to enter these mains. In order to lift some of the water into two service reservoirs, one at Northfield and the other at Warley, which supply outlying districts at too great an elevation to be adequately dealt with by gravitation, a pumping-station has been erected containing three sets of pumping plant capable of exerting in the aggregate about 200-horse power, each set being able to pump water either to Warley or Northfield. The steam for these engines is supplied by two Babcock and Wilcox boilers working at a pressure of 150 lbs. on the square inch. The station also contains the necessary plant and appliances for lighting by electricity the whole of the works. A complete system of measuring and recording instruments has been installed, whereby the quantity of water received, in store, or sent out, can at any moment be determined. The work has been carried out under contract by Mr. A. Kellett, of Ealing. The machinery has been supplied by Messrs. Glenfield and Kennedy, Limited, of Kilmarnock. The Resident Engineer until the work was near completion was Mr. Macaulay, who now occupies the position of Resident Engineer of the Elan supply, on taking which office he was succeeded by his principal Assistant, Mr. A. Wilfrid Lewis.

After the inspection, tea was served in a marquee. At the close of the repast, an address was given by the Lord Mayor. In the course of it he sketched the history of the scheme, which has been brought to a successful completion by the arrival of Welsh water in Birmingham.

In order to convey to the visitors some idea as to the amount of work the carrying out of the scheme had entailed on the Council and the officials, he said he had asked Mr. Lees to prepare a few figures which he would submit to them. In connection with the Elan scheme alone, no fewer than 430 Committee meetings had been held, of which the Chairman attended 388—a remarkable record, especially when it was remembered that for the greater part of one year he was entirely laid aside by serious illness. The number of resolutions passed had been 9379; and the transactions of the Committee—nearly all of them important negotiations dealing with large figures, and requiring much deliberation—were recorded in the bulky minute books containing 9427 foolscap pages. The duration of the meetings must also be borne in mind. Of the total number, 38 were held at the works; and the majority of each of these extended over three days, with a good portion of the nights thrown in. The meetings held in Birmingham in the earlier years commonly occupied a whole day; and even now the normal Elan Committee meeting lasted upwards of three hours. During the same period the work of the General Water Department was not neglected, and 631 meetings were held, of which Alderman Parker attended 569; giving a grand total of 1061 meetings, and an attendance to the Chairman of 957, or more than 90 per cent. No one anticipated, when the Council decided to carry out the work in the Elan Valley by administration, the vast amount of labour it would entail; and in this connection it would be impossible to tabulate the work of the Committee, and especially of its Chairman. The details were enormous, and not one was shirked, but everything was faced. No member of the Council, past or present, had ever more zealously, more conscientiously, more unostentatiously, and more unselfishly devoted himself to the public weal than Alderman Lawley Parker: and his services could not be measured by any statistics. Those of them who had worked with him would never forget the kindly interest he always took in all the workpeople, and his desire to make their lives bright and happy. In this, as they were aware, he had the willing co-operation of Mrs. Lawley Parker, who accompanied him on most of his many visits to the works. In fact, the Committee had always felt that, in all his duties, the Chairman had the sympathy and help of his wife, who had thus become an unseen, but efficient, *ex officio* member. He must add that it would be impossible to underestimate the value of the services rendered by Alderman Beale, who filled the position of Chairman during Alderman Parker's illness. The accounts had naturally been of a complicated nature; and many a fright and sleepless night had been given them by Alderman Clayton in estimating the cost of the scheme. To one and all they owed their warmest thanks, and he asked them to charge their glasses and drink, in the water from the Elan stream, their thanks to the Water Committee, with the name of whose Chairman, Alderman Lawley Parker, he coupled the toast.

The toast having been heartily drunk, Alderman Parker responded. He thanked the company on behalf of the Water Committee, himself, and his "better half," for the kind words that had been spoken, and for the manner in which they had been received. He paid a tribute to the immense help which he had had from the officials, and especially from Mr. Lees, whose aid alone had made it possible for him to grasp the thousand-and-one details that came under his attention during his chairmanship. He need hardly say that they had been most fortunate in having the help of the greatest Water Engineer in the world; and he very much regretted that, owing to illness, Mr. James Mansergh was not able to be present that day. They welcomed, however, his son and partner, Mr. Ernest Mansergh, whom he would ask to convey their earnest hope that his father would speedily be restored to health, and their appreciation of the grand manner in which he had carried out the work. The Water Committee naturally felt a great relief at the knowledge that the water was at last coming into Birmingham, and that for the rest of their lives, and he hoped the lives of their successors for many generations, there would be no anxiety as to the water supply of the city. He believed the Welsh water which they now possessed would prove a great blessing for all time. In conclusion, he expressed the regret that had often been felt during the carrying out of the scheme that the late Sir Thomas Martineau was not still with them to have the pleasure of seeing the completion of the work with the initiation of which he had been so closely associated.

The party then re-entered the carriages, and were conveyed back to Birmingham.

METROPOLITAN WATER BOARD.

Mr. Walter Long on the Work of the Board.

The members of the Metropolitan Water Board entertained their Chairman (Mr. R. M. Beachcroft) at a complimentary dinner last Thursday, at the Savoy Hotel. Mr. John Glass (the Vice-Chairman) presided, having on his right the guest of the evening, and on his left Mr. Walter Long, the President of the Local Government Board. The loyal toasts having been honoured, Mr. E. B. Barnard proposed "His Majesty's Ministers." Mr. Long, in responding, remarked that the proposer of the toast had alluded to him as the godfather of the Water Board. He did not know whether he was to be regarded as its parent; but, in any case, he was proud of the offspring. The growth of the Board had been most remarkable, though the work which it had done in a short time had been unknown to most Londoners and to the people of this country. He knew that the creation of the Board was the subject of great controversy, and it was predicted that it would be certain to fail. These forecasts had been falsified, and their falsification had been largely due to the tact, energy, and good sense of their Chairman. Up to the creation of the Board, the city of Birmingham had had the largest undertaking of the kind. But, great as it was, it involved a capital of only £1,400,000, whereas the purchase of the undertakings of the London Water Companies involved an amount of £42,000,000, and, as the proposer of the toast had said, it was the greatest instance of municipal trading that the country had ever seen. He recognized the important work which had been done by Mr. Beachcroft and his colleagues; and perhaps he might be permitted to mention the name of Lord Welby, who, as Chairman of the Finance Committee, had been specially associated with Mr. Beachcroft in all the great negotiations incidental to the transfer. He should like also to pay a tribute to the Court of Arbitration, which had performed its duty with singular dignity and fairness, and with great success. The Board was now but on the threshold of its labours; and he hoped it might have a prosperous future. Its success was indeed assured if the members would allow the caution and prudence which they had shown in the past to govern their future action. On behalf of the Government Department most concerned with their work, he thanked Mr. Beachcroft for the public spirit and devotion with which he had accepted the office he held. The Chairman proposed the health of the guest of the evening, eulogizing his great services to the Board, and expressing the confidence which his colleagues had in him. In testimony of this, he asked Mr. Beachcroft to accept a silver bowl and a handsome hall clock as presents from his colleagues. Mr. Beachcroft, in acknowledging the gifts and the toast of his health, said the Water Board had already shown that some of the criticisms which were expressed on its creation were not justified. They had appointed a most efficient staff, and had arranged for the most perfect supervision of that staff by a series of Committees. He added that there must be no question of going to Wales for water for many years, or of the softening of London water at a cost of something like a quarter-of-a-million per annum. These things would come in time.

LAMBETH WATER-WORKS COMPANY.

A Meeting of Holders of 7½ per Cent. Stock in this Company was held at their late Offices, Brixton Hill, on Thursday, pursuant to requisitions from holders of such stock to the aggregate nominal value of not less than £20,000, requiring that the scheme prepared by the Directors under Schedule IV. of the Metropolis Water Act, 1902, for the application and distribution of the compensation to which the Company have become entitled under the Act shall be submitted to a meeting of the stockholders. Viscount HAMPDEN, G.C.M.G., was called upon to preside.

The SECRETARY (Mr. H. Wilkins) having read the notice convening the meeting,

The CHAIRMAN explained the object bringing the shareholders together, and called on the representatives of the dissentient shareholders to state their case.

Mr. W. CAPEL SLAUGHTER (Messrs. Slaughter and May) said he had issued circulars as the representative of one of the stockholders, Mr. George Cawston, for whom he originally acted, and others joined later. The amount to be distributed was £4,664,700 of 3 per cent. Metropolitan water "B" stock, which had been accepted, with the authority of the proprietors, in lieu of £4,260,000 of the cash payable, which was awarded by the Arbitrators; and a sum of £41,000 was reserved in cash for payment of expenses. The Directors' scheme of distribution was as follows: For every £100 of 10 per cent. ordinary stock, holders were to receive £347 17s. 6d. in new water stock, and for every £100 of 7½ per cent. stock, £254 9s. The Directors quite frankly stated that they had given the stockholders of both classes an amount of new water stock to produce dividends equal to the prescribed dividends of 10 per cent. and 7½ per cent. Having arrived at the figure of £254 9s., they proposed to distribute he balance of stock among the holders of the 10 per cent. and 7½ per cent. stock respectively, proportionately, as nearly as might be, to the present value of the amount of arrears of previous dividends; so that, in addition to what each stock obtained under the proposal to give the stockholders sufficient water stock to produce a dividend of 10 and 7½ per cent., the 10 per cent. holders got £4 10s. per cent. and the 7½ per cent. people £4 9s. per cent. Under the fourth schedule of the Metropolis Water Act, 1902, the scheme which had been promulgated by the Directors became binding unless, at a meeting of the stockholders, it was dissented from by the holders of the particular class who were affected by it in proportions which were described, though not with great clearness, in the schedule. Therefore, if the scheme was to be submitted to the decision of the Court, it must be dissented from by an effective resolution at that meeting. If such a resolution was passed, it would be the duty of the Directors to submit their scheme to the Court for a decision as to whether it was just or equitable, having regard to the various interests of the stockholders. He ventured to think that the scheme did not correspond with these considerations. Under the Lambeth Water-Works Act, 1856, the capital rights of the 7½ per cent. stock were identical with those of the other stocks. He thought the interests of the 7½ per cent. stockholders had, in the present instance, been disregarded. There were authorities of the House of Lords for saying how the fund should be distributed. First of all it should have been used in returning to the stockholders the amount of their capital stock, and the surplus should be applied rateably, according to the participation in capital stock of both classes of holders. The speaker proceeded to quote the decision of the House of Lords in the Bridgewater Canal case, which was that the sum that remained over, after paying all the debts and liabilities of the Company, and returning the paid-up capital, was to be distributed equally among the ordinary and preference shareholders, in proportion to the shares held by them. In effect, the preference and the ordinary shareholders were treated as one class. He admitted that the Directors believed their scheme to be a just and fair one; but he did not think they had rightly considered the Act of 1856 or the Bridgewater decision. The proper mode of distribution, and the method the Court would be likely to order, would be that, after returning to both classes of stockholders the full amount of their stock, the balance should be distributed per share per cent. He thought the meeting was governed by the fourth schedule; and this being so, proxies were not available. He moved a resolution dissenting from the scheme.

Mr. CAWSTON seconded the motion.

After considerable discussion,

The CHAIRMAN described the proposal as rash, bad, and immoral. He said he did not wish to enter into a legal argument, but he would point out that the money to be divided did not represent the assets of

a business on dissolution of partnership, but compensation for compulsory expropriation. Further, the law of partnership had not been correctly set forth. Had it been so, a very different result would have been shown. The stockholders were asked to make an assumption—and it was a very large order—that the Court would decide in their favour. The Bridgewater case quoted in the circular was in an entirely different category from that under discussion. Personally, he could not imagine the Court giving a decision without a consideration of what was just. The justice and equity of the calculation made by the Directors was clearly proved by the fact that it compared very closely with the Stock Exchange valuation of the stock. He considered that he was justified in the use of the word "immoral," and quoted an instance of how unfairly the proposal of the dissentient shareholders would operate. If the preference shareholders agreed with Messrs. Slaughter and May, they would apparently receive a much larger amount; but the question to be decided was whether they had any moral right to trust to some technicality of the law to seek to obtain an advantage which was clearly not theirs, having regard to what was just and equitable. If the stockholders fell in with the views of the dissentients, liquidation would be delayed, the distribution of compensation and interest would be deferred for many months, the procedure would be costly, and the value of the security would be depreciated. The legal gentlemen were the only people who could benefit by such a course.

A vote was then taken.

The CHAIRMAN announced that the total amount of stock held in the room was £24,892. Of this, there was for the motion £3820; against it, £14,997; neutral, £6075. The motion was therefore lost.

A long discussion ensued as to the admissibility of proxies; and eventually it was agreed that the figures should be recorded. The effective proxies in favour of the motion were £4125, and against it £159,610. The proxies tendered, but rejected, in favour of the motion were £53,672; against it, £13,261; uncertain, £300. The rejection of the proxies was due to their being received too late, or because they were delivered by a second or subsequent holder of a joint account.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

We have had in Glasgow to-night the opening, or, as the rules require it to be called, the annual general meeting of the Scottish Junior Gas Association, Western District. It is possible that the dual form in which the Scottish Junior Association has been cast may be a little confusing; but the experience which has already been had points to its being the best possible working system. At no place, either in the east or west, or at any intermediate point, could the attendances have been secured which have graced the opening meetings of the two districts; and the size of the gatherings held under the auspices of the Association will at all times be the touchstone of the prosperity of the movement. To-night's meeting was magnificent in point of numbers. I understand that prior to the meeting more than 100 members had paid their subscriptions. Both before and after the meeting subscriptions were pouring into the hands of the Treasurer; and it is anticipated that soon there will be a membership on the roll numbering not less than 150. Here, surely, there has been discovered a field, hitherto undreamt of, in which a fruitful return may be had for labour bestowed in the promotion of the efficiency of the gas engineer. When so many are to be found flocking to the sources of enlightenment, we may conclude that a desire to be instructed exists. This is as happy an augury for the future of the Junior Association as is the other consideration which I emphasized last week—the encouragement which they are receiving.

These two features, taken together, lead to the conclusion, indeed, that the Juniors have fallen upon happy times. This is a feeling, too, which is accentuated when we consider another feature of the movement, a feature which is as prominent as any—that is, the unrevealed talent among the ranks of the Juniors which has been brought to light. A perusal of the matter which was laid before the Western District to-night brings that very forcibly home. Mr. James Lowe, the President, addressed himself to the stability and permanence of the gas industry, in view of the increasing competition to which it is subjected. A more aptly chosen subject to lay before a body who are qualifying for the position of gas engineer could not have been selected. It was an answer to the question which we can well conceive would be in the minds of some: Why am I here? When the answer is considered, it will be found that not only was it conclusive in favour of the permanence of a demand for gas, but that it was, as an intellectual production, a very ably prepared article. It is an article worthy of a wide circulation, which, it is a satisfaction to know, it will receive. Then the paper by Mr. A. Smith, upon "Gas-Works Construction," was one which could have been given by few as the outcome of their own observations. There are not many whose experience of the building and reconstruction of gas-works has been so extensive as Mr. Smith's. Few could enter into the numerous details, and give adequate reasons for the doing of every item of work in a certain manner, in the way he did. That it was not more fully discussed is due to two reasons. Its length curtailed the time, and its fulness removed the opportunity for criticism except upon small points, as to which there will always be abundance of difference of opinion. There was sufficient in the paper for several communications, and it is to be hoped that the authors of papers in future will take to heart the advice of Mr. A. Wilson, and keep theirs rather shorter. This does not detract at all from the value of Mr. Smith's paper as an educative agent. On the contrary, in that capacity it would be of great value were a copy of it, as Mr. Wilson hoped there would be, in the hands of every member. Taken altogether, the meeting was a most excellent start to the winter's work of the district. The many friends of the Association will assuredly be pleased if, having put their hand to the plough in the manner they have done, the members will continue, as zealously as they have begun, to prosecute their work.

Mr. G. Malam reported to the Dumfries Town Council on Thursday that during the year to May 15 the quantity of coal carbonized in the Corporation gas-works was 10,051 tons, and there was, in addition, 3 tons of shale oil. The average cost, for coal and oil, was 15s. 6·727d. per ton. The quantity of gas yielded was 97,597,000 cubic feet; being an average of 9707 cubic feet per ton. The quantity of gas sold (including that used in the works and extra in public lamps) was 86,877,348 cubic feet; being an average of 8643 cubic feet per ton. The unaccounted-for gas amounted to 10·98 per cent. on the quantity made—an increase of slightly over 1 per cent. This was to be accounted for by extra pressure being given earlier in the morning than before, for the use of gas-engines, also in the increased quantity of gas burned in public lamps fitted with incandescent burners, and in the extra amount consumed in the pilot lights of the public lamps, which had not been taken into account hitherto. The new gasholder was almost completed. It had been tested and found satisfactory; and it was now receiving a final coat of paint. With this holder the storage capacity was raised from 300,000 to 800,000 cubic feet. The reserve fund amounted to £1316. The Gas Committee recommended that out of the profits £1000 be added to the reserve fund, and that the price of gas be reduced by 2d. per 1000 cubic feet all round. This would make it 2s. 10d. to ordinary consumers, 3s. 3d. to users of prepayment meters, and 2s. 7d. per 1000 cubic feet to owners of gas-engines, over and above which there are discounts allowed ranging from 2½ to 7 per cent. The Committee reported that they had had under consideration a proposal to put on higher price to consumers outside the burgh boundaries than that charged within; and they recommended that a charge of this nature be made on and after November, 1905—the amount of the difference to be then fixed. Mr. Currie moved adoption of the minutes of the Committee. This having been agreed to, Mr. Currie then proceeded to explain, with reference to the proposal to raise the price of gas to consumers beyond the burgh boundaries, that, of course, the increased price would be charged in Maxwelltown, but that they thought it right to give twelve months' notice of the change. All that was meant by the recommendation was that notice be given of the change. Mr. Smyth, who had dissented in Committee, thought that if they were making a profit by the gas undertaking, it did not matter to them where their customers lived. Provost Glover pointed out that the matter was still to come up for discussion, and no more was said. Now, as to this subject, it requires to be pointed out that Maxwelltown is a large burgh which is separated from Dumfries by the River Nith. The inhabitants obtain their supply of gas from Dumfries, but have no voice in the administration of the gas undertaking, nor do they run any risk in the event of failure or disaster. It is this last consideration that moves some of the Dumfries councillors towards charging a higher price to the outside consumers. The practice is so common that it may almost be said to be inherently right. But it is certainly one of the things which an outside consumer will be hard to convince is right; and it is a question whether in Dumfries, where they have tolerated the existing arrangement for twenty-six years, a change should now be made which would certainly create feeling, and might injure the business of the gas undertaking.

An explosion of acetylene gas occurred in Dundee on the evening of Saturday last, and caused the death of a youth named James Millar. It is the practice of the Salvation Army to light their open-air meetings on winter evenings by means of acetylene gas-lamps carried upon poles. Millar worked the lamp all last winter. It was taken out for the first time on Saturday night. On returning to the quarters of the Army, Millar went downstairs with it into a cellar. He asked a comrade to assist him in taking out the inner cylinder. The comrade refused, and advised him to leave it alone. He then left the cellar, and in a short while the explosion occurred. The poor youth was found lying on his back on the floor, and the dome of his skull was blown off. He was taken to the Infirmary, where he expired soon after admission, without being able to say how the accident occurred.

Some strange stories are told regarding the valuation of gas-works, the principles ruling which do not seem to be very well understood. Thus, for instance, it is a puzzle to some gas managers to understand why their works are valued so much more highly than their neighbours', whose financial position is quite as good as their own. It would seem as if certain assessors took maintainable profit as the standard, which is the correct thing to do when valuing for a transfer, but certainly not for assessment. For assessment purposes, it is the profit earned which is the standard; a percentage, usually about 10, is struck off as the profit which a hypothetical tenant would be content with. This system has its drawbacks, inasmuch as, by careful working, the valuation can be kept down. It is here where the temptation to proceed upon maintainable profit comes into play. Of course, if anyone is of the belief that his undertaking is rated at more than it should be, he has the right of appeal. Ordinarily the appeal is to the Corporation; but in cases where the undertaking belongs to the Corporation, it is not seemly that they should appeal to themselves against a valuation fixed by their own official. In such cases, the appeal can be taken to the Assessor of Canals and Railways, who understands the Valuation Acts thoroughly, and whose decisions have been generally upheld. It is to be feared that the body of assessors is largely made up of Inland Revenue officials, the bent of whose training is in the direction of the view that the community is not sufficiently taxed. In the hands of a pronounced type of this class, it is easy to conceive of valuations being fixed at a higher rate than is reasonable. The subject is of great importance to gas managers, who might, with profit, make it matter of discussion at their meetings. It is a subject upon which interchange of opinion might lead to good results—results that would be beneficial to both managers and assessors. At present, working in isolation, both parties are in the dark; with fuller information, some general principle might be discovered which would lead to a more uniform practice. That good work can be done in even isolated instances is illustrated by the experience at Dunbar this season. The Assessor fixed the valuation of the Corporation gas undertaking there at £706, which, in the opinion of the Gas Manager—Mr. T. O'Neill—was much too high. He lodged an appeal, in which he asked that the sum should be reduced to £518. Before the Court sat, however, the Assessor and Mr. O'Neill met; and as the result of their deliberations, a middle course was agreed upon, the

Assessor agreeing to strike £90—about half of the difference—off his valuation. This Mr. O'Neill accepted, and the appeal was not proceeded with. It is obvious that the Assessor must have been convinced that he could not maintain his valuation; but at the same time the settlement is not a satisfactory one, inasmuch as it is only a compromise. Mr. O'Neill has been able to save his Commissioners a good deal this year; but he should not relax his efforts until he is able to secure a more reasonable valuation upon a permanent footing. This is eminently a case in which wider knowledge would be of much value.

The Pitlochry New Gaslight Company have been obliged to take the field in their own defence. A private company have been moving in the direction of introducing electric light into the district, and, among other things, they have petitioned the Trustees of the late Mr. E. F. Barbour, of Bonsheid, for permission to use the Falls of Tummel for driving their generating machinery. In reply to this, the Directors of the Gas Company have laid before the Trustees a representation as to how the electric scheme would affect the Company. They state that the Gas Company has been in existence for about fifty years. The capital of the concern is £6500, all of it subscribed by local people. New gas-works have been erected at a cost of £5000. Previous to erecting the new works, the Directors made full inquiry as to whether it would be feasible to introduce electric lighting into Pitlochry, and they were advised by Professor Forbes that the supply of water at the Falls of Tummel would be quite inadequate to give the necessary power. They observe that it has been stated that, provided the waters of the Tummel could be utilized, it would be possible to supply light by electricity at half the present price of gas, which is 7s. 6d. per 1000 cubic feet. This statement led the Directors to make further inquiries, with the result that they have expert testimony to the effect that it is "quite impossible" to supply electricity even at the same price as gas. The Directors consider that independent expert opinion should be obtained before any arrangement is made with the promoters of a scheme which, in their opinion, is likely to prove a failure. The only result of carrying into effect the present electric lighting proposals would be to saddle the place for all time with a defective electric installation, and to injure the Gas Company for a time.

The Banff Gaslight Company, over whose fortunes Mr. W. Marshall so ably presides, had an income last year of £2195, of which £2037 was derived from the sale of gas, £49 from meter-rents, and £109 from coke, tar, &c. There was a profit of £322, out of which a dividend at the rate of 5 per cent. was paid, and £24 was carried forward. The cost of coal was £839, and benzol to the value of £64 was used in the enrichment of the gas. There is a reserve fund amounting to £169.

The Edinburgh and District Water Trustees made their annual inspection of the new water-works at Talla at the end of last week. As stated recently, these works are expected to be completed in about a year. There is, therefore, no need to say more in regard to them except that everything was found to be going on satisfactorily, and the Contractor—Mr. J. Best, of Edinburgh—was universally congratulated upon their forward condition.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 8.

Sulphate of Ammonia.

Demand has been well sustained, and all available parcels have been readily absorbed. There has been some inquiry from the Continent, but not much actual buying; prices for the home production being something below the equivalents of those current in the United Kingdom. From other points there has been good inquiry, the premiums required for forward delivery compelling attention to the prompt and near positions. The closing quotations are £11 17s. 6d. per ton f.o.b. Hull, and £12 to £12 1s. 3d. per ton f.o.b. Liverpool and Leith. For October-December delivery £12 5s. per ton is quoted, and for January-June makers remain firm at £12 10s. per ton; but so far these prices have not been reported paid. In London, £12 2s. 6d, Beckton terms, is quoted for October-December, and £12 10s. per ton for January-June.

Nitrate of Soda.

This article is very firm in all positions, and spot prices have been advanced to 10s. 6d. and 10s. 9d. per cwt. for ordinary and refined qualities respectively.

LONDON, *Oct.* 10.

Tar Products.

There has been rather more business doing generally during the past week; and prices as a rule show signs of improvement. Further sales of 90 per cent. benzol have been made at 9½d. per gallon f.o.b. London; and it is reported that a large business has been arranged all over next year with Continental consumers. The exact particulars, however, have not yet transpired. Solvent naphtha continues in fairly good demand; but entirely for home consumption. Prices remain in about the same position; but there is not that anxiety to sell on the part of makers which prevailed some little time ago. In anthracene, it is reported that negotiations are pending between makers here and German consumers for a large quantity all over next year; but the price has not yet transpired. Carbolic acid continues very firm. The demand is decidedly good for crude. A large business has again been done at 2s. for November-December, and in one instance this price is reported to have been paid for January-June. As a rule, however, consumers do not care to buy so far forward, and will not exceed 2s. for November-December, although most of the makers have now advanced their price to 2s. 0½d. and even 2s. 1d. over this period. Crystals are also rather better; and business is reported in 34-35 per cent. at 6d. for early delivery. Creosote is scarcely so firm, especially in the North, where there is more offering for prompt delivery, and makers continue fairly anxious to clear out stocks. The demand for export, however, still continues fairly good, and London makers are rather firmer in their ideas. There has been a good deal of business doing in pitch, especially in the London market, where sales are reported at 28s. 6d. to a very considerable extent. Makers are asking even higher prices than this. On the Continent, however, prices still rule very low, and dealers appear to be offering at under the equivalent of prices which are being quoted in England.

The average values during the week were: Tar, 17s. to 20s. 6d.; pitch, London, 28s. 3d. to 28s. 6d.; east coast, 27s. 3d. to 27s. 6d.; west coast, 26s. to 26s. 6d. Benzol, 90 per cent., 9¼d. to 9½d.; 50-90 per cent., 7d. to 7¼d. Toluol, 6½d. to 6¾d. Crude naphtha, 2⅝d. to 3d.; solvent naphtha, 8d. to 8½d.; heavy naphtha, 10d. to 10½d. Creosote, London, 1⅞d. to 1 15/16d.; North, 1¾d. to 1⅞d. Heavy oils, 2d. to 2 1/16d. Carbolic acid. 60 per cent., 2s. Refined naphthalene, £4 10s. to £8; salts, 21s. to 22s. 6d. Anthracene, "A" quality, 1⅜d. to 2d.; "B" quality, 1d., nominal.

Sulphate of Ammonia.

The market continues very steady, and there is a good demand, especially for forward delivery. Beckton still quote £12 for prompt, but ask £12 2s. 6d. for November-December. The South Metropolitan Company are not at present offering anything for October delivery; and they report having declined £12 5s. for November-December. In Hull, there has been a good business done at about £11 17s. 6d. for prompt; and makers ask £12 2s. 6d. for November-December, although at present buyers will not entertain business at this price. The market closed firmer; business being reported at £12 per ton for October delivery. In Leith, sales are reported at £12 for prompt and £12 2s. 6d. November-December. There are several inquiries in the market for January-June; but makers are quoting almost prohibitive prices for this period. In Liverpool, prices remain fairly high, and the demand appears to be very good for both prompt and forward delivery.

In our London report last week it was stated that "the position of pitch remains unchanged;" and among the quotations, the London price was given as 27s. to 27s. 6d. We are informed that during the week not one but several large parcels of London pitch were sold at the price of 28s. 6d. f.o.b. We may add that it is always a pleasure to us to receive, from authoritative sources, the prices at which business is done in residual products; so that comparison may be made with the prices emanating from the markets.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The coal market continues steady in most departments. House varieties have not gone out in quite the same volume as had been expected; but colder weather having again set in, with an almost certain prospect of continuance, little fear need be entertained of any lessened output. The demand for slack remains firm at the quotations below. As indicative of the amplitude of the supply, a firm sent in a tender to the Electricity Committee of the Salford Corporation for unwashed slack at 6s. per ton, which was accepted; but subsequently the tenderers objected to the strike clause in the Corporation form of contract, when the clause was amended to meet with their wishes. In another coal contract with the Gas Committee, the desire of the same firm was not complied with, whereupon they withdrew their contract. Engine and forge coal continues in fair request; and there is a satisfactory inquiry for coal for export. The following were the quotations for the week: Best house coal 13s. to 14s. per ton at the pit, secondary 11s. to 12s., and common 9s. to 10s.; steam and forge coal, best 8s. to 8s. 6d., common 7s. 6d. to 7s. 9d.; best slack 6s. to 6s. 6d., secondary 5s. to 5s. 6d., and common 4s. to 4s. 6d.

Northern Coal Trade.

The northern coal trade shows the change that is usual when the Baltic is nearer closing. There is more effect of this on the steam coal trade, which depends very largely indeed on the exports; while the gas coal trade has the benefit of the full home demand at this season. Best Northumbrian steam coals are 9s. per ton f.o.b., second-class steams are 8s. 3d., and steam smalls are 4s. 3d. to 4s. 6d. The collieries are well employed, but forward orders are fewer. In gas coals there is a considerable increase in the consumption; and the deliveries on the long contracts now take up a large part of the output of the best coal collieries. The current quotation is from 7s. 9d. to 8s. 3d. per ton f.o.b. for occasional cargoes. There is rather more inquiry for gas coal for next season's shipment; and one or two contracts are said to have been settled at prices that are believed to be near those just named. In the coke trade, values are barely maintained; and as gas coke is now in larger output, the price is quieter, though the exports are maintained. Good gas coke is 13s. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

Trade remains steady. This is the most that can be said of the present. As to the future, the outlook is more hopeful; it being looked upon as highly probable that masters and men will come to an amicable settlement as to wages. The prices quoted are: Main 7s. 3d. to 7s. 6d. per ton f.o.b. Glasgow, ell 8s. 3d. to 9s. 3d., and splint 9s. to 9s. 3d. The shipments for the week amounted to 247,030 tons—a decrease of 496 tons upon the preceding week, and of 1934 tons upon the corresponding week of last year. For the year to date, the total shipments have been 8,682,245 tons—an increase of 263,610 tons upon the corresponding period.

The Altrincham Town Council and the Gas-Works.—Replying to a communication from the Altrincham Town Council, Mr. F. R. B. Lindsell, the Secretary to the Gas Company, states, with respect to the sale of the Company's concern to the Local Authority, that the purchase-money, calculated on the basis of 25 times the full statutory dividend, would be £187,000. The amount of the mortgage bonds was £18,000; and the earliest date at which a transfer could take effect would be Dec. 31, 1905.

Water-Meters for Checking Waste.—Water consumption in Lawrence (Mass.) increased so rapidly in 1901-2 that the Water Board ordered meters to be placed on all services which were not already provided with them. Up to the end of 1903 they had been set on most of the services supplying two or more tenements, resulting in a saving of more than 70 million gallons of filtered water. The consumption was about 40½ gallons per head daily last year.

Pontefract Corporation and the Gas-Works.—As the outcome of the refusal of the Directors of the Pontefract Gas Company to lower the price of gas, it was proposed at the last meeting of the Corporation that the Gas and Water Committee should be instructed to take into consideration the possibility of effecting a purchase of the undertaking. The belief was expressed that the Company would not be unwilling to sell. The proposition was unanimously agreed to.

St. Mary Church Gas-Works.—The Torquay Town Council decided last week to borrow £2927 for purposes connected with the gas-works at St. Mary Church. Mr. Pike, a member of the Council, said that when the works were taken over on the extension of the borough four years ago, they were described as a very valuable asset. Since then £11,000 had been spent on them. The present loans, it should be explained, are for new mains and the relaying of old ones, slot-meter installations, new cookers, and meters and services.

Kidderminster Water Supply.—At their meeting last Wednesday, the Kidderminster Town Council decided, by a substantial majority, to proceed at once to complete the scheme for perfecting the water supply of the borough, at a total cost of £18,000. One-third of the Corporation supported a motion to further defer the execution of the scheme; but it was urged that the question had been under discussion for four years, and that frequently the borough had only received a partial supply of water. The Local Government Board have already approved of the complete scheme.

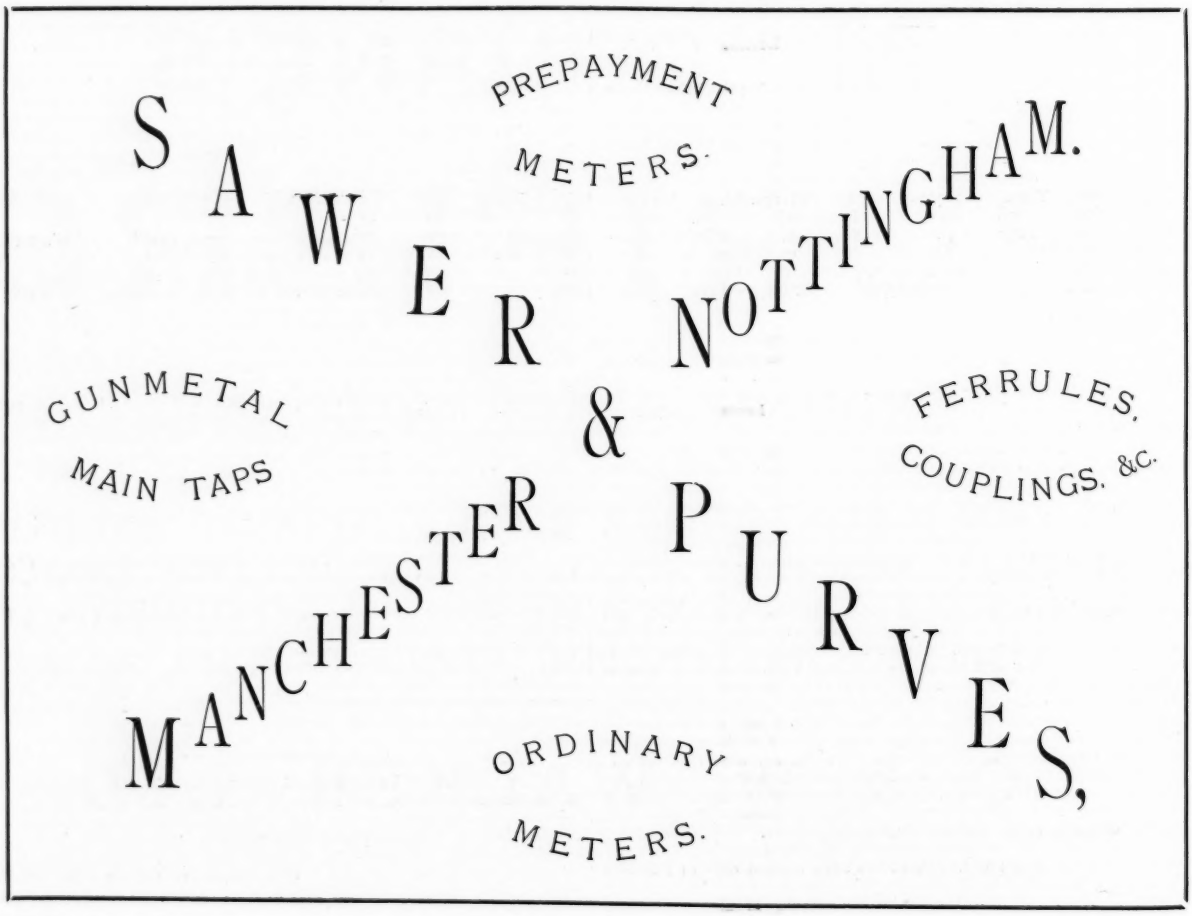
The Wood Green Electric Lighting Scheme.—Several members of the Wood Green District Council feel very strongly upon the refusal of the Local Government Board to sanction a loan for carrying out an electricity scheme. At the last meeting of the Council, Mr. Marlow Reed contradicted the prevalent belief that the refusal had put an end to the Council's hopes to be able eventually to provide electricity for themselves, instead of the supply being in the hands of a company. They had one of the best combined municipal schemes the country knew of; and it was a piece of political vice that their loan was refused. They had learned something since bringing forward their £43,000 scheme, and now their plan might be to go in for a £50,000 scheme, by which the outlay on the mains would be very much less. He moved—"That this Council regrets the decision of the Local Government Board, but still adheres to its repeatedly expressed resolution to obtain a municipal supply of electricity, according to the powers granted by Parliament, and instructs the Electricity Committee to consider and report upon the situation." This was carried.

Devonport Water-Works Arbitration.—In consequence of the Long Vacation, there has been further delay in delivering the award in the arbitration between the Devonport Corporation and the Devonport Water Company for the purchase of the undertaking of the latter. It should have been ready for taking up on the 29th ult.; but the time had now been extended to the 25th of December. Mr. Ram, K.C., the new Arbitrator, held his only sitting on the 23rd of July, the proceedings at which were reported in the "JOURNAL" for Aug. 2.

Gas-Works Extensions at Haverhill.—Last Wednesday, four new purifiers were opened at the Haverhill Gas-Works, by Alderman W. B. Gurteen, the Chairman of the Urban District Council, who afterwards entertained the Gas Committee and officials to a champagne lunch. The purifiers, which are 12 feet square by 4½ feet deep, were supplied by Messrs. J. Firth Blakeley and Co., of Dewsbury. They form the first part of a scheme which will include the erection of an additional holder, as soon as the Committee see their way clear. During the proceedings, the Chairman of the Gas Committee (Mr. J. B. Coster) and the Manager (Mr. G. F. Cutting) were heartily congratulated on the manner in which the whole of the work had been carried out.

Stockport Water Supply.—At a recent meeting of the Water Committee of the Stockport Corporation, the Kinder Sub-Committee reported that, in view of the steady and substantial increase in the consumption of water, they had been considering how the supply could most advantageously be augmented; and they recommended that application should be made to Parliament for powers to take water from the River Kinder prior to the completion of the Kinder reservoir, and that conduit No. 1, authorized by the Stockport Corporation Water Act, 1901, should be laid as far as Disley, and an additional main laid to carry the water so abstracted to the existing Disley reservoirs. After a lengthy consideration of the matter, it was unanimously resolved that the necessary application should be made to Parliament next session. This was agreed to by the Council at their meeting last week.

The Cost of the Chard Gas Purchase.—Public opinion in Chard, which was much perturbed by the amount of the award in the arbitration for the purchase of the gas-works by the Corporation, has been further excited over the presentation of the bill of costs. At a meeting of the Town Council last week, Mr. Small severely commented on various items in the bill and especially criticized those members of the Council who constitute the Parliamentary Committee. These gentlemen, he said, had charged £10 10s. each for appearing in London as witnesses, in addition to their attending and hotel expenses. The Mayor said the items had been put into the bill on the advice of the Parliamentary Agents. Witnesses were required, and if members of the Council had not attended, other persons must have been paid. Mr. Small said only one was called as a witness. Members of the Committee, although warned that they would not be wanted in London, nevertheless went up, and charged their full expenses.



Slot Meters as Life Savers.—In commenting on the decrease in the number of fatal lamp accidents reported to him, a provincial Coroner said he attributed the improvement partly to increased care in the selection and handling of lamps, but chiefly to the introduction of penny-in-the-slot gas-meters.

Gas Consumption at Barry.—At a meeting of the Barry Gas and Water Committee lately, it was reported that instead of the £1000 estimated to be required in respect of the gas and water undertaking, only £300 was wanted; the difference being due to the fact that there had been a large increase in the consumption of gas. Mr. M'Cann moved for a Sub-Committee to investigate whether the price of gas could not be reduced; but the motion was adjourned.

Gas for School Lighting.—At their meeting on Monday last week, the Woking School Managers had before them a report of the Finance Committee to the effect that they had considered the question of lighting the schools, and made the following recommendations: "That the whole of the Maybury Schools be lighted with gas, with Lucas lights fitted in all the larger rooms, and an outside lamp placed at each entrance, and that application be made to the Central Committee for the work to be done." The report was adopted.

A New Reservoir for St. Helens.—A new covered reservoir at Brown Edge, capable of holding 10 million gallons, was recently opened by the Mayor of St. Helens (Alderman J. Massey, J.P.), who was presented with a silver key as a memento of the occasion. The reservoir was constructed from the designs of the Water Engineer (Mr. J. J. Lackland). It is 338 feet long, 315 feet wide, and 16 feet deep; and it will bring the total service reservoir capacity of the town up to 12½ million gallons. The reservoir is constructed entirely of concrete; and the total cost of the work, including mains and connections, but exclusive of the land, has been £28,105, or equivalent to £2 15s. 3d. per 1000 gallons capacity.

New Electricity Works for Torquay.—Considerable doubt continues to be expressed at Torquay as to the wisdom of the policy to which the Town Council are committed in connection with their electricity undertaking. It has become necessary to erect new works on a site which will permit extensions when required, which is impossible in the present works. In view of the proposed introduction of electric tramways, the new works are to be adapted for the supply of current for traction as well as lighting, and are to cost £42,000. A few days ago, tenders were before the Council for the erection of the chimney-shaft for the new works. Doubt was expressed by several members as to the wisdom of proceeding with the undertaking until it is quite certain that the Tramway Company will be able to carry out their agreement with the Corporation. The Mayor and other speakers contended, however, that, whether or not the tramways were provided, provision must be made to meet the increased demand for electricity for lighting; and though it was suggested that very much smaller works would suffice if tramway traction had not to be considered, it was decided to accept the tender recommended.

Assessment of the Darlington Gas-Works.—A difference having arisen between the Darlington Guardians and the Town Council with regard to the assessment of the gas-works, it has been agreed to refer the matter to arbitration, the cost of which will be equally divided between the parties. The amount in dispute is about £1700.

Cirencester Gas Company, Limited.—The annual general meeting of this Company was held on the 30th ult., when the report presented showed that the business of the Company had been progressive and remarkably good. The quantity of gas sold exceeded that of the preceding year, which was a record one, by 1,696,900 cubic feet. Owing to the reduction in price of 2d. per 1000 cubic feet from Michaelmas, 1903, the amount received was only £73 beyond that of the year 1902; but the residuals produced rather more than £260 in excess of that period. The balance standing to the credit of the revenue account was £2913; and the Directors recommended the payment of dividends for the half year of £11, £7 14s., and £5 10s. per cent. on the several classes of shares, and the placing of £250 to the depreciation account.

The Carriage of Coal to Belfast.—The Belfast Gas Committee have been considering the question of chartering vessels to convey coal from English ports to the gas-works; but the Chief Clerk has advised them that their powers, under the Act of 1874, do not permit of this being done. They then discussed the desirability of procuring barges and conveying the coal from the ships to the works; and it was resolved "that the facts be placed before the Local Government Board, with a view to their favourably considering the proposal to procure and work barges, and giving their consent to the necessary expenditure." The Board, however, replied that they observed Counsel had advised the Corporation that they had no power to incur expenditure for this purpose. The Board added that they were not empowered to authorize a payment not allowed by law; and that, even if such authorization were given, it would not render the payment legal.

Visit to the Bury Gas-Works.—Last Saturday week, about a hundred of the citizens took advantage of the facilities afforded to the members of the local Ratepayers' Association to visit the gas-works. The party were met by Alderman Fletcher (the Chairman of the Gas Committee) and Mr. H. Simmonds (the Gas Manager), and were first of all conducted to the tar distillery at Deardens. After this, they returned to the gas-works, over practically the whole of which they were shown; particular attention being drawn to the machinery by which the coal is received at the railway siding and automatically dealt with. It was pointed out that from the time the coal was delivered at the works until it left in the form of gas, tar, or coke, it was never handled once. In the Manager's room, Mr. Simmonds showed what could be produced from a pound of coal, and explained that nothing whatever was now wasted. During the past six years, he said, the aggregate profit on the gas undertaking was about £60,000. Before the party left, votes of thanks were accorded Alderman Fletcher, Mr. Simmonds, Mr. Harold Smith (the Chemist), and Mr. J. Taylor (the Inside Manager).

MILBOURNE'S

PATENT LUTELESS

PURIFIERS

SAVE

GAS, GROUND SPACE, & CONNECTIONS.

ERECTED OR IN HAND AT THE FOLLOWING GAS-WORKS:

WREXHAM, DORKING, MITCHAM, RUGBY, EVESHAM, BOLOGNA (ITALY), SEDGELEY, VALPARAISO (CHILI), BANGOR (IRELAND), DRAYCOTT, BRITISH GAS COMPANY (ETRURIA STATION), STRATFORD-ON-AVON, KIDDERMINSTER, KETTERING, NORTH MIDDLESEX, &c., &c.

SOLE MAKERS—

C. & W. WALKER, LTD.,

Midland Iron Works:
DONNINGTON, NEWPORT, SALOP.

London Office:
110, CANNON STREET, E.C.

Improved Lighting at Axminster.—Considerable improvements have recently been carried out at the Axminster Gas-Works, and new and larger mains have been laid. The result is a vast improvement in the supply of gas, which was formerly inadequate; while the lighting of the streets has been greatly enhanced by fixing incandescent lamps in the more important positions.

Electric Lighting Twice the Cost of Gas at Mexborough.—Small consumers of electricity in Mexborough feel that they have been victimized, and they express their grievance in a petition which was presented at the last meeting of the District Council. They say they were induced to use current by the statement made on handbills issued by the Council that at 5d. per unit electricity would be as cheap as, or cheaper than, gas at 3s. 3d. per 1000 cubic feet. Actual experience has taught them that electric light works out at double the cost of gas. It may be added that there was a heavy loss on the past year's working of the Council's undertaking, notwithstanding that nothing was allowed for renewals or depreciation.

Cheaper Gas for Windsor.—In moving the adoption of the report and balance-sheet at the recent half-yearly meeting of the Windsor Royal Gaslight Company, the Chairman (Mr. J. L. Hollis, J.P.) said there had been an increase of nearly 2 million cubic feet, or 4½ per cent., in the quantity of gas sold. The unaccounted-for gas was under 4 per cent.; and the quantity sold per ton of coal carbonized was over 10,300 cubic feet. The Board were glad to be able to announce that the price would be reduced by 2d. per 1000 cubic feet as from the 1st inst. He added that they had supplied gas of over 15½-candle power throughout the six months, though the Act only specified 14 candles; and he pointed out that if everyone would use incandescent burners for lighting, the latter power would be quite sufficient for illumination and cooking and heating. The price then could be still further reduced. The amount available for distribution was £3263; and full dividends on all the classes of shares were declared.

Comparative Cost of Gas and Electricity.—The Wrexham Town Council have been contemplating an extension of their electric lighting cables; but the proposal having met with some opposition, it has been referred back to the Electric Supply Committee for further consideration. A ratepayer points out in a local paper that the prospect of a profitable return to the Corporation on the extension is not clear; it having been demonstrated over and over again that electricity costs four times as much as incandescent gas in public lamps. He gives the following comparative figures for the two illuminants: One incandescent gas-burner yielding over 60-candle power, and consuming 4 cubic feet of gas per hour, will consume in 1800 hours 7200 cubic feet of gas, which at 2s. 9d. per 1000 net will cost 19s. 9½d. Add cost of maintenance, at 9d. per quarter, 3s., and the inclusive cost is £1 2s. 9½d. To obtain the same lighting power by 16-candle electric incandescent lights, four lamps would be required, taking in 1800 hours over 400 units, which at 4½d. per unit would cost £7 10s. Taking off 5 per cent. discount, 7s. 6d., the net cost for current only is £7 2s. 6d.

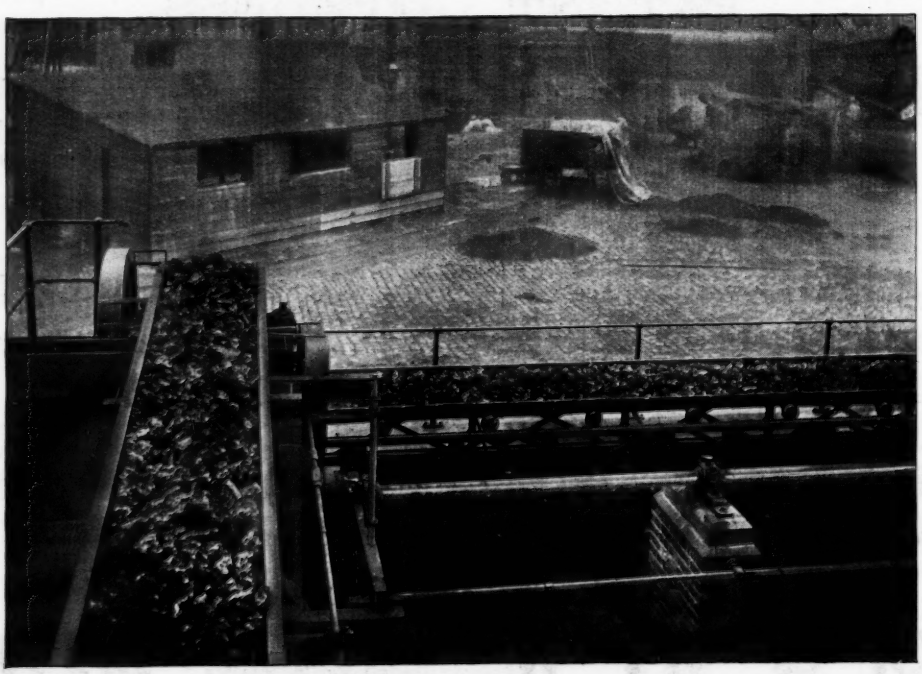
The Cost of the Barnsley Water Scheme.—It is announced that something like a further £80,000 is required to complete the Midhope Water scheme of the Barnsley Corporation. The original estimate was about £170,000; but up to the present the outlay has been nearly £300,000. The question has recently been discussed by the Council in Committee; and it is stated that as a result application is to be made for power to borrow the additional sum named.

Gas Purchase Question at Otley.—The Sub-Committee of the Otley District Council who were recently appointed to consider the advisability of promoting a Bill for the purchase of the local gas undertaking, have presented a report in which they suggest that this should be done. In submitting the report to the Council, the Chairman (Mr. Greaves) pointed out that in the Otley Gas Company's Act of 1901 there was a clause which stated that if a Bill for the purpose named was promoted in Parliament within the next four sessions, no opposition would be offered beyond the protection of the Company's own interests. The time for exercising this prerogative was fast passing away; and therefore it was necessary to move at once. By eight votes to two, the Council approved of the Committee's recommendation.

The Depth of Mains Question in Dublin.—At the meeting of the Dublin City Council last Thursday, the County Surveyor (Mr. Collen) brought forward a notification of the plans submitted to him by the Gas Company in connection with the laying of their mains. He was not satisfied with the depth at which the pipes were to be laid, as, in his opinion, it was not sufficient to secure them from injury by steam-rollers. The Chairman (Mr. P. J. O'Neill, J.P.) said the law seemed to be with the Company. Mr. Shannon (Solicitor) urged that the matter should be contested with the Company. The Chairman thought the Council should continue in the attitude they had taken up to the present, and stand by their own officer's decision as to what he regarded as the proper depth for the laying of the gas-pipes, and should refuse to accept the decision of the Police Magistrate on this question, no matter how often repeated. This course was agreed to.

Rio de Janeiro and Electricity and Alcohol as Illuminants.—According to paragraphs which have been going the round of the Press, Rio de Janeiro has been occupying itself afresh with the question of artificial illumination. It is stated, for example, by the "Pall Mall Gazette" that the city "is about to be supplied with establishments for the supply of electric power; two companies having been formed for this purpose. One of these is of local organization, with a capital of 4,000,000 milreis. The other has been incorporated in Canada, with a capital of $50,000,000, subscribed partly by Americans and partly by Canadians. As a competitor in some way of electricity, alcohol is also now engaging much attention as an illuminating and industrial agent. Its employment is much advocated in the interest of the sugar industry of the country, which has fallen into a very precarious condition. An exhibition of apparatus used in the production of alcohol and its application did much to show the public the possibilities of the article; and it is expected that an increased demand for commodities connected with this branch of trade will result."

NEW CONVEYOR CO., LTD.,



SMETHWICK.

Write for Particulars of ARCHD. LITTLE'S PATENT CONVEYORS FOR COAL AND COKE.

A. J. S. B. LITTLE, Director and Manager. W. T. HOLLAND, Secretary.

The Salford Corporation have granted £50 towards the funds of the Earl's Court Exhibition.

The Luton Gas Company have reduced the price of gas to 2s. 3d. per 1000 cubic feet as from Michaelmas.

The Directors of the Imperial Continental Gas Association recommend a dividend of 5 per cent. for the half year ended June 30, free of tax.

The Local Government Board have intimated to the Halifax Corporation that sufficient reason has not been shown for extending the period of repayment of the sum of £91,685 recently sanctioned by them for water-works purposes.

Great satisfaction was expressed with the lighting of the hall at Luton which was specially built for Mr. Chamberlain's meeting last week. This was carried out by means of 25 Lucas lamps, having an illuminating power of 15,700 candles.

Messrs. Joseph Taylor and Co., of Bolton, have received a repeat order for one of their latest builds of 1½-inch plate-lead saturators, with a 2-inch bottom, for the Blackpool Corporation, in connection with their No. 2 sulphate of ammonia plant.

We have just received from Messrs. Falk, Stadelmann, and Co., Ltd., a copy of their new Catalogue No. 206 of gas fittings and accessories. The list is a most complete one, extending as it does to nearly 350 pages; and it should prove of considerable use to gas managers during the forthcoming busy season.

The new offices of the Bristol Gas Company, which were described and illustrated in the "JOURNAL" a few weeks ago, are brought under the notice of architects by means of a double-page plate in the current number of the "Builder." The Architect of this very effective building is Mr. W. V. Gough, of Bristol.

As a consequence, it is said, of one of the Russian Companies having been selling forward under the agreed-upon price, the Scotch Oil Companies have broken away from the understanding to only sell for prompt delivery. The Companies will now sell for forward delivery; and they have fixed the season's price of burning oils at 5¾d. to 6¼d. per gallon.

An additional 1d. per ton on coal brought to London was imposed by the Railway Companies from the 1st inst., after due notice of the increase. The railway returns for 1903 give the coal brought to London by railway in 1903 as only 7,102,000 tons. This additional 1d. per ton would therefore amount to about £29,000 a year, to be distributed among about six Companies.

Carbon from gas-retorts was held by the Board of General Appraisers to be duitable at 20 per cent. *ad valorem*, under paragraph 415 of the present Tariff Act. An analysis showed the substance to contain 92·66 per cent. of fixed carbon, and it was assessed for duty, under paragraph 97, at 25 per cent. *ad valorem*, as an "article composed of carbon." The Board held that it was similar to coke, and reversed the action of the Customs authorities.

By an announcement last week in our advertisement columns, our readers will see that on the 20th inst. Messrs. Alexander, Daniel, and Co. will offer for sale £15,000 of 7 per cent. maximum consolidated stock of the Bristol Water Company, in lots of £100 and upwards, at the reserved price of £147 per £100 of stock.

We have received from the "Omega" Odourless Gas-Stove Company, Limited, of Bristol, a copy of a new price list of their rapid hot-air circulators. In addition to illustrations of the different styles of stove, and sundries for use with same, which the Company have on sale, the booklet contains a description of the construction of the apparatus and a statement of the advantages claimed for it.

The electric light is not in favour with the Whitehaven Board of Guardians. At a recent meeting, a motion condemning a proposal by the County Council to introduce electricity at the asylum was passed. One member said an expression of opinion going from a town like Whitehaven on the question of electric light would be very valuable. They knew from sad experience that they were promised that the electric light undertaking would be a gold mine, or something equal to it, instead of which it has proved a very serious loss.

The "Iron and Coal Trades Review" learns that contracts have been entered into for some 30,000 tons of Durham coal (stipulated brands) for the Naples Gas-Works—one-half at 14s. 2d. a ton, c.i-f. Naples, and the other for a specially good coal at 14s. 6d., which figures are estimated to leave 8s. and 8s. 6d. respectively f.o.b. ex tax. It is also reported that a London firm of merchants have just contracted for 150,000 tons of good Durham gas coals intended for shipment to the Baltic, at a cost of slightly under 8s. a ton, f.o.b. ex tax.

A new Association—the Institute of Hygiene—having for its object the dissemination of knowledge on the subject of personal and domestic hygiene, has lately been formed. It aims to be self-supporting; and in order to accomplish this, there has been organized a permanent exhibition of hygienic products and appliances—for example, foods, clothing, filters, stoves, &c.—open free to the general public. The revenue gained from the rents paid by exhibitors will be devoted to educational work, which will take the form of local lectures, with examinations and certificates. The exhibition, which was opened by Sir J. Fayrer on the 30th ult., is held at 34, Devonshire Street, W.

We have received from the Wholesale Fittings Company their new season's catalogue of novelties. The Company's business now consists entirely of the supply incandescent mantles, burners, and accessories; and they are shown in great variety in the 80 closely printed pages of which the catalogue consists. The Company are agents for the "Star" inverted burners and mantles, and samples of these and globes are included. The Company, who are also proprietors of the "Bonbac" "Natco," and "Coninco" mantles, state that the first-named mantle is now being used for street lighting in Farringdon Street and Holborn; and it is said that the City authorities are quite satisfied with it. Among other municipal bodies who have adopted the mantle for public lighting are the Walsall Corporation.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 4,000,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

SUPERINTENDENT (CAPE TOWN). Cape Town Gas Company. London Offices.
ENGINEER AND MANAGER. Padiham Gas Department. Applications by Oct. 31.
ENGINE DRIVER. Gas and Water Works Supplies and Construction Company, Limited.
METER MAN. Sutton Water Company. Applications by Oct. 18.

Situations Wanted.

ENGINEER IN GAS-WORKS. W. Jackson, Leven, Fife.
SUPERINTENDENT. Distribution Department. No. 4271.

Plant, &c., For Sale.

HIGH-POWER LAMPS. Stamford and St. Martins Gas Company.

Company Meeting.

IMPERIAL CONTINENTAL GAS ASSOCIATION. Cannon Street Hotel. Nov. 1. 2.30.

Stocks and Shares.

BARNET GAS AND WATER COMPANY. Oct. 25.
CROYDON GAS COMPANY. Nov. 1.
ILFORD GAS COMPANY. Oct. 18.
LOWESTOFT WATER AND GAS COMPANY. Oct. 25.
SOUTH ESSEX WATER COMPANY. Oct. 25.
SOUTHEND WATER COMPANY. Oct. 18.
STIRLING GASLIGHT COMPANY. Nov. 8.
WEST KENT GAS COMPANY. Oct. 18.

TENDERS FOR

Benzol.

HEYWOOD GAS DEPARTMENT. Tenders by Oct. 18.

Coke.

PINNER GAS COMPANY. Tenders by Oct. 13.

Water-Gas Plant.

ROCHDALE GAS DEPARTMENT. Tenders by Oct. 19.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 99.

Issue.	Share.	When ex-Dividend	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Apl. 14	10½	Alliance & Dublin 10 p.c.	20—21	..	5 0 0
100,000	10	,,	7½	Do. 7 p.c.	13¼—14½	..	5 3 5
200,000	5	May 12	6½	Bombay, Ltd. . . .	6½—6⅝	..	4 16 4
140,000	5	,,	6½	Do. New, £4 paid	4⅜—5⅛	..	4 18 11
50,000	10	Aug. 31	14	Bourne- 10 p.c. . .	29—30	+1	4 13 4
251,810	10	,,	7	mouth Gas B 7 p.c. .	14¼—15¼	..	4 10 4
53,200	10	,,	6	and Water Pref. 6 p.c.	14—15	..	4 0 0
580,000	Stk.	Aug. 12	12	Brentford Consolidated	215—240	..	5 0 0
300,000	,,	,,	9	Do. New . . .	178—183	..	4 18 4
50,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11
206,250	,,	June 10	4	Do. 4 p.c. Deb. .	102—105	..	3 16 2
220,000	Stk.	Sept. 15	11	Brighton & Hove Orig.	207—212	..	5 3 9
246,320	,,	,,	8	Do. A. Ord. Stk. .	148—153	+2	5 4 7
460,000	20	Sept. 29	10	British	38½—39¼*	..	5 1 3
100,000	Stk.	Aug. 12	6	Bromley, Ord. 5 p.c. .	114—118	..	5 1 9
165,700	,,	,,	4½	Do. do. 3½ p.c. .	88—93	..	4 16 9
500,000	10	May 12	7	Buenos Ayres (New) Ltd.	11½—12	..	5 16 8
250,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	92—94	..	4 5 1
150,000	20	July 14	8½	Cagliari, Ltd.	22—24	..	6 17 6
100,030	10	Sept. 29	10	Cape Town & Dis , Ltd.	13⅝—14⅝*	..	6 17 11
100,000	10	Apl. 28	4½	Do. 4½ p c Pref. .	9¼—9⅝	..	4 12 4
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	51—53	..	5 13 2
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk	98—100	..	4 10 0
1,375,000	Stk	Aug. 31	5/10	Commercial 4 p c Stk. .	108—112	..	4 12 10
560,000	,,	,,	5	Do. 3½ p.c. do. .	104—107	..	4 13 6
450,000	,,	June 10	3	Do. 3 p.c. Deb. Stk.	83—86	−½	3 9 9
800,000	Stk.	June 10	6	Continental Union, Ltd.	102—107	..	5 12 2
200,000	,,	,,	7	Do. 7 p c. Pref.	135—140	..	5 0 0
486,090	10	July 14	11	European, Ltd. . . .	19¼—20½	..	5 7 4
354,060	10	,,	11	Do. £7 10s paid	14—15	+½	5 10 0
15,243,200	Stk.	Aug. 12	4 4/10	Gas- 4 p.c. Ord. . .	94—96	..	4 11 10
2,600,000	,,	,,	3½	light 3½ p.c. max. . .	87—89	..	3 18 8
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	107—110	..	3 12 9
4,193,975	,,	June 29	3	Coke 3 p.c. Con. Deb.	87—89	..	3 7 5
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
70,000	10	Sept. 29	11	Hongkong & China, Ltd.	15—16*	..	6 17 6
3,800,000	Stk.	May 12	10	Imperial Continental .	204—207	..	4 16 7
473,600	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb Red.	95—98	..	3 11 4
175,036	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c. .	115—120	..	5 0 0
561,000	Stk.	Aug. 31	10	Liverpool United A . .	218—220	..	4 10 11
718,100	,,	,,	7	Do. do. B . .	158—160	..	4 7 6
306,083	,,	June 29	4	Do. do. Deb. Stk.	106—108	..	3 14 1

Issue.	Share	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
75,000	5	June 29	5	Malta & Medn., Ltd. .	4¼—4⅜	..	5 5 3
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb..	101—103*	..	4 17 1
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	98—100*	..	4 10 0
541,920	20	May 27	3½	Monte Video, Ltd. . .	10⅝—11⅛	..	6 1 9
1,515,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	104⅝—105	..	4 5 9
406,625	Stk.	July 1	3½	Do. 3½ p.c. Deb.	92—92½	..	3 15 8
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	19—20	..	5 0 0
52,940	1	,,	7	Do. 7 p c.	13—14	..	5 0 0
300,000	Stk.	May 12	8	Oriental, Ltd. . . .	142—147	+2	5 8 10
600,000	5	Sept. 15	7	Ottoman, Ltd. . . .	5½—6½	..	5 12 0
235,005	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	5	Primitiva Ord. . . .	5⅛—5⅜	+⅛	4 6 11
796,980	5	July 28	5	Do. 5 p.c. Pref. .	4¼—4⅜	..	5 5 3
492,500	100	June 1	4	Do. 4 p.c. Deb. .	93—95	..	4 4 3
851,070	10	Apl. 28	7	River Plate Ord. . . .	11½—12	..	5 16 8
300,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	93—95	..	4 4 3
250,000	10	Sept. 15	6	San Paulo, Ltd. . . .	11—12	..	5 0 0
70,000	50	June 29	5	Do. 5 p.c. Deb. .	49—51	..	4 18 0
135,000	Stk.	Mar. 10	10	Sheffield A	237—239	..	4 3 8
209,984	,,	,,	10	Do. B	236—238	..	4 4 0
523,498	,,	,,	10	Do. C	234—236	..	4 4 9
123,998	Stk.	Sept. 29	5	Shrews'bury Ord. 5 p.c.	104½—107½	..	4 13 0
70,000	10	,,	11	South African	15—16*	..	6 17 6
6,250,000	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	125—127	..	4 6 8
1,832,700	,,	July 14	3	Do. 3 p.c. Deb.	87—89	..	3 7 5
575,000	Stk.	Aug. 31	5½	S'th Suburb'n Ord. 5 p.c.	117—122	+2	4 10 2
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	126— 25	+2	4 0 0
112,533	,,	July 14	5	Do. 5 p c. Deb. Stk.	133—138	..	3 12 6
380,940	Stk.	May 12	5	Southampton Ord. . .	105—110	..	4 10 11
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6¼	Tottenham A 5 p c. .	120—'25	+2	5 0 0
325,520	,,	,,	4¼	and B 3½ p.c. .	95—100	..	4 15 0
115,000	,,	June 29	4	Edmonton 4 p.c. Deb.	104—107	..	3 14 9
182,380	10	June 10	8	Tuscan, Ltd.	8¾—8⅞	..	9 2 10
149,900	10	July 1	5	Do. 5 p c. Deb. Red.	96—.8	..	5 2 0
30,000	Stk.	Aug. 31	7⅛	Wands- A 5 p.c. . .	150—155	..	5 0 0
255,636	,,	,,	6¼	worth B 3½ p.c. . .	120—125	..	5 0 0
50,000	,,	,,	5 17/20	and C 3½ p.c. . .	102—107	..	4 18 2
59,416	,,	June 29	3	Putney 3 p.c. Deb. Stk.	78—83	..	3 12 8
745,872	,,	Aug. 12	5	West Ham 5 p.c. Ord. .	95—100	..	5 0 4
85,000	,,	,,	5	Do. 5 p.c. Pref. . .	115—120	..	4 3 4
160,000	,,	June 29	4	Do. 4 p.c. Deb. Stk.	103—108	..	3 14 1

Prices marked * are Ex div.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London E.C. "Volcanism, London."

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.

BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.

WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.

REPAIRS RECEIVE PROMPT ATTENTION.

Telephones: 254 Oldham, and 2412 HOP, London.

Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd., (Eerste Hollandsche Yzererts Maaty), ROTTERDAM.

General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.

London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.

General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

OXIDE OF IRON.
(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.

BALE'S FIRE CEMENT, PAINT, AND GAS COAL

5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manu-facture of SULPHATE OF AMMONIA.

SPENCER, CHAPMAN, AND MESSEL, LIMITED, 86, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 341 AVENUE.

BROTHERTON & CO., LIMITED.

Offices: Commercial Buildings, LEEDS.
Correspondence invited.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

TO GAS AND WATER OFFICIALS.

MELROSE CYCLES and Slot Copper COLLECTORS. Latest Design and lowest Prices. For Cash or gradual payments. Catalogue free.

MELROSE CYCLE COMPANY, COVENTRY.

"NUGEPE" CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.

For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

AMMONIACAL Liquor wanted by JOHN RILEY & SONS, Hapton, near ACCRINGTON.

THE KEITH LIGHT.

OVER 1600 INSTALLATIONS IN DAILY USE.

SEE illustrated advertisement in next week's issue.

JAMES KEITH AND BLACKMAN, Co, LTD., 27, Farringdon Avenue, LONDON, E.C.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are pre- pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.

SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.
Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

COAL GAS TAR wanted.

BEST PRICES GIVEN.

SHARPNESS CHEMICAL COMPANY, LIMITED, Sharpness Docks, GLOS.

PATENTS AND TRADE MARKS PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

SULPHATE OF AMMONIA
SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

ENGINEER (Age 24) who has served his time with a good Gas Engineering Firm, desires Situation in Gas-Works. Has good Gas-Works Experience. Testimonials sent on if desired.
Address W. JACKSON, High Street, Leven, FIFE.

TO GAS-FITTING MANUFACTURERS.

THE Advertiser, having represented Hodge & Co., of London, on the South Coast for upwards of 40 Years, is open to represent any similar House. He has an excellent connection with Gas Companies and Fitters.
Address I. L. LOWE, Hambleden House, Brentford, MIDDLESEX.

SUPERINTENDENT DISTRIBUTION DEPARTMENT.

WANTED, re-engagement as above. Practical knowledge of Gas-Fitting in all branches, including Automatic Work. Experienced in the Control of Workmen, Mainlayers, Estimating, Time Sheets, Public Lighting, &c. Highest References.
Address No. 4271, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CAPE TOWN AND DISTRICT GASLIGHT AND COKE COMPANY, LIMITED.

WANTED for South Africa, to work under Manager, a smart SUPERINTENDENT for the Suburban Gas-Works of this Company, making ½ Million feet daily. Must be good Carbonizer and have practical knowledge of Water-Gas Plant, Testing, &c. One with knowledge of Constructional Work preferred. (No out-door work.) Commencing Salary, £300.
Apply CAPE TOWN GAS COMPANY, 35, New Broad Street, LONDON, E.C.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

THE Gas and Water-Works Supplies and Construction Company undertake all Gas and Water Work, Main Laying, &c. Gas and Water Works Financed and Loans Granted. Shares and Stock accepted in part payment for Work and Materials supplied. Gas-Works purchased outright.
Address, 99, CANNON STREET, LONDON, E.C.

SPENT OXIDE.

THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.
Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "METROGAS, LONDON."

WANTED, at the Pumping-Station of a small Country Water-Works, an ENGINE DRIVER. One who has had Experience with Hornsby's Oil Engine, and thoroughly understands Gas and Water Service and Main Laying.
Applications should be made stating full Particulars with lowest Wages, and *copies* of Testimonials, to the GAS AND WATER-WORKS SUPPLIES AND CONSTRUCTION COMPANY, LIMITED, 99, Cannon Street, LONDON, E.C.

THE Sutton District Water Company, Sutton, Surrey, require the services of a METER MAN. The applicant must be thoroughly acquainted and used to reading and repairing Kennedy and all other classes of Water-Meters, and must be capable of Wiping a Plumber's Joint. Cyclist preferred. Salary 35s. per week.
Applications, accompanied with *copies* of Testimonials, stating Age, &c., to be addressed to the ENGINEER and MANAGER not later than the 18th inst.

URBAN DISTRICT COUNCIL OF PADIHAM.

APPOINTMENT OF GAS ENGINEER AND MANAGER.

THE Urban District Council of Padiham invite APPLICATIONS for the post of GAS ENGINEER and MANAGER, at a Salary of £130 per annum, increasing after Two Years to £156* if his services are satisfactory.
The person appointed will have charge of the Council's Gas-Works, and will be required to perform all the duties usually performed by a Gas Engineer and Manager.
The person appointed must devote his whole Time to the duties of his Office.
Applications, stating Age, Experience, and Qualifications, and accompanied by *copies* of not more than Three recent Testimonials, to be sent to me on or before the 31st day of October, 1904, marked "Gas Engineer and Manager."
Canvassing Councillors, either directly or indirectly, will be a disqualification.

JAS. C. WADDINGTON,
Clerk to the Council.

Council Offices, Mill Street,
Padiham, Sept. 28, 1904.

* This amount was inadvertently printed as £136 in our issue for Oct. 4.

NEW Gasholder, 40 ft. diameter by 12 ft. deep, with Steel Standards; also new STEEL TANK to contain same.
Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

"DEMPSTER'S" Direct-Acting Re- ciprocating Pumps, Exhausters, and Steam-Engine Combined. Two Sets, 8-inch and 12-inch Connections. Overhauled and Guaranteed. Cheap. Room wanted.
FIRTH BLAKELEY & Co., Gas Engineers, DEWSBURY.

PURIFIERS for Sale.—Set of Four 10- feet square, Planed Joints, Modern Centre Valve, Connections, &c., complete. Re-erected and guaranteed. £280 if sold promptly. Other sizes and plant in Stock.
J. FIRTH BLAKELEY & Co., Gas Engineers, Thornhill, DEWSBURY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

STAMFORD AND ST. MARTINS GASLIGHT AND COKE COMPANY.

THE above Company have for Sale Two 700-candle power LUCAS LAMPS for exterior lighting. Also One 900-candle power WELSBACH LAMP. All complete with Frogs and in good condition.
Apply, with Offers, to

H. GREEN,
Secretary.

Stamford, Sept. 30, 1904.

PINNER GAS COMPANY, LIMITED.

THE Directors invite Tenders for the purchase of their surplus COKE from the 17th of October, 1904, to the end of March, 1905. Probable quantity, 350 to 450 Tons. Free on rail Pinner Metropolitan Station.
Tenders to be sent in not later than noon, Oct. 13, 1904, addressed to the Pinner Gas Co., Ltd., 28, Great James Street, Bedford Row, London, W.C., and endorsed "Tender for Coke."
The Directors do not bind themselves to accept the highest or any Tender.

Gas Offices, Pinner,
Middlesex.

TAR Contracts Wanted on the Sliding- Scale or at Fixed Prices.
Managers and Secretaries desirous of selling to best advantage, please communicate with DENT AND Co., Ouse Chemical Works, SELBY.

BOROUGH OF HEYWOOD.

THE Gas Committee are prepared to receive TENDERS for the supply of BENZOL.
Specification and Form of Tender may be obtained upon application to Mr. W. Whatmough, Gas Manager.
Sealed Tenders, endorsed "Benzol," to be sent to me not later than Tuesday, Oct. 18, 1904.

By order,
GEO. G. BOUCHIER,
Town Clerk.

Municipal Buildings,
Heywood, Sept. 14, 1904.

BOROUGH OF ROCHDALE.

WATER-GAS PLANT.

THE Gas and Electricity Committee of the above Corporation invite TENDERS for the supply and erection of a WATER-GAS PLANT, in two sections, each capable of producing 750,000 cubic feet per day.
Conditions of Tender and all further Information required may be obtained on application to Mr. T. Banbury Ball, the Manager, at the Gas-Works, Dane Street.
Tenders, endorsed "Water-Gas Plant," must be sent in to me not later than noon on Wednesday, Oct. 19, 1904.

By order,
WM. HENRY HICKSON,
Town Clerk.

Town Hall, Rochdale,
Oct. 6, 1904.

To Trustees and Others.—By order of the Directors o

THE CROYDON GAS COMPANY.

SALE OF £2500 FIVE PER CENT. AND £5000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

HOOKER and WEBB have received in- structions to SELL BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Tuesday, 1st November, 1904, at Two o'clock precisely, in 82 Lots,
£2500 FIVE PER CENT., and £5000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK of the Croydon Gas Company. The Reserve and Insurance Funds at Midsummer last amounted to £44,522 8s. 11d. The paid-up Ordinary Capital at that date was £310,000, whereas the Debenture Stock then issued amounted to £37,500, thus showing that the stock now offered is a security of the highest class.
Particulars and Conditions of Sale may be had of the Secretary, at the Offices of the Company, Katharine Street, Croydon; at the Mart, E.C.; and of Messrs. HOOKER & WEBB, Auctioneers and Surveyors, 4, High Street, CROYDON.

STIRLING GASLIGHT COMPANY.
(INCORPORATED BY ACT OF PARLIAMENT).

SALE OF £10,000 NEW ORDINARY SHARE CAPITAL.

NOTICE is Hereby Given, that as authorized by the resolution of an Extraordinary Meeting of Shareholders held at Stirling, on Friday, the 23rd of September ultimo, it is the intention of the Directors of the Company to SELL BY TENDER, to be received at the Secretary's Office, Wolf Craig, Stirling, not later than Two p.m. on the 8th day of November, 1904,

TEN THOUSAND POUNDS OF NEW FIVE PER CENT. ORDINARY SHARES OF THE COMPANY.

The Shares now for Sale are the first issue of Additional Capital under, and subject to, the provisions of the Stirling Gas Order, 1904 (confirmed by the Gas Orders Confirmation No. 3 Act, 1904). The Standard Rate of Dividend is Five per cent., subject to the Sliding-Scale Clauses, under which the authorized rate of dividend (so long as the price of Gas continues at 2s. 10d. per 1000 cubic feet) is

£5 10s. PER CENT. PER ANNUM.

The Dividend may be increased by Two Shillings and Sixpence per cent. for every additional Penny taken off the price of 1000 cubic feet of Gas.
The Shares will be of the value of £10 each, and a deposit of £2 10s. per Share on the nominal amount applied for must accompany each Tender, with the full amount of premium offered. £2 10s. per Share will be payable on allotment, and the balance of £5 on or before the 16th day of December next.

MINIMUM PRICE PER SHARE £10 10s.

The Company for the past Two Years, 1903-04, paid the full statutory dividend authorized under the Sliding-Scale provisions of the Incorporating Act of 1898.
The amount of undivided profits at May 15, 1904 (after providing for all known liabilities, paying £3520 6s. 7d., as full dividend on the original capital, and placing an additional sum of £500 to the credit of the Insurance Fund) carried forward to the credit of this year's account, was £2547 0s. 1d. Since 1898, the Company has paid £5000 out of revenue on capital expenditure, and in addition has expended nearly £20,000 on extensions of plant and other capital charges, including a new gasholder, &c., &c. The works are now in the most modern and efficient condition. New Purifiers have recently been erected, and Sulphate of Ammonia Plant is been introduced, which will effect considerable economy in the Manufacture and disposal of Bye-Products of Gas. The sale of gas has increased from 58,530,000 cubic feet in 1898 to 89,240,000 cubic feet for the year ended the 15th of May last. Since that date, a satisfactory rate of progress has continued.
Full Particulars, Forms of Application, and Conditions of Tender, may be obtained at the Office of Mr. David Chrystal, Solicitor, 64, Murray Place, Stirling, or at the Office of the Secretary.

By order of the Board,
EBEN. GENTLEMAN,
Secretary.

2, Wolf Craig, Stirling,
Oct. 1, 1904.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By Order of Trustees and others.

STOCKS AND SHARES

IN THE

ILFORD GAS COMPANY, and the

WEST KENT GAS COMPANY.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, October 18, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 2500 NEW ORDINARY FIVE PER CENT. MAXIMUM £10 SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Tuesday, October 18, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

BARNET DISTRICT GAS AND WATER COMPANY.

NEW ISSUE OF £6000 "D" CAPITAL GAS STOCK.

MR. ALFRED RICHARDS, will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 25, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors of the

LOWESTOFT WATER AND GAS COMPANY.

NEW ISSUE OF 400 ADDITIONAL ORDINARY £10 SHARES, AND £1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 25, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTH ESSEX WATER-WORKS COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION at the Mart, E.C., on Tuesday, Oct. 25, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

CHELSEA WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of the Governor and Company of Chelsea Water-Works WILL BE CLOSED after Thursday, the 20th day of October inst., in respect of the Ordinary Stock, the Five per cent. Preference Stock, the Four-and-a Half per cent. Perpetual Preference Stock, and the Four-and-a-Half per cent. Preference (Convertible) Stock of the Company, and that after that date no transfers of any of these Stocks can be accepted for registration.

By order,
G. H. GILL,
Secretary.

Office: 41, Commercial Road,
Pimlico, London, S.W., Oct. 8, 1904.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of Proprietors of this Association will be held at the City Terminus Hotel, Cannon Street, London, E.C., on Tuesday, the 1st of November next, at 2.30 p.m. precisely, when a Report will be made to the Proprietors, a Dividend declared for the Half Year ended the 30th of June, 1904, and the usual Ordinary Business of such Meeting transacted.

Notice is Hereby also Given, that the CAPITAL STOCK TRANSFER BOOKS WILL BE CLOSED from the 18th inst. to the 1st prox., both days inclusive.

The Dividend will be paid on the 8th of November.

By order of the Board,
ROBERT W. WILSON,
Secretary.

21, Austin Friars, London, E.C.,
Oct. 10, 1904.

STEAM, OIL, and WATER.

Any Range of Pressure.

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16, DEANSGATE, MANCHESTER,
Gas Engineers' Agents and Contractors for METERS, FIRE-CLAY GOODS, OXIDE OF IRON, AND ALL OTHER GAS APPARATUS.
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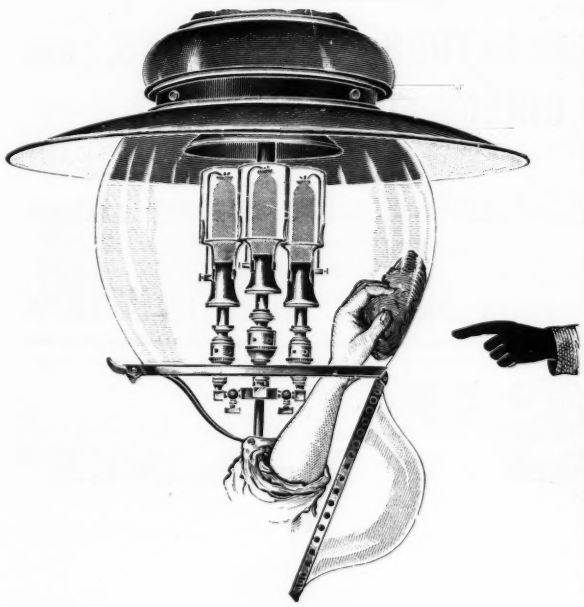

Part Illustration of Veritas-Celestra Lantern with Special Globe enabling attendant to remove Burners and clean Globe without taking it down.

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Special terms to Gas Companies and Municipal and District Councils.

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FOR
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Full Particulars may be obtained from the Sole Makers.
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[See Illustrated Advertisement, Oct. 4, p. 70.]

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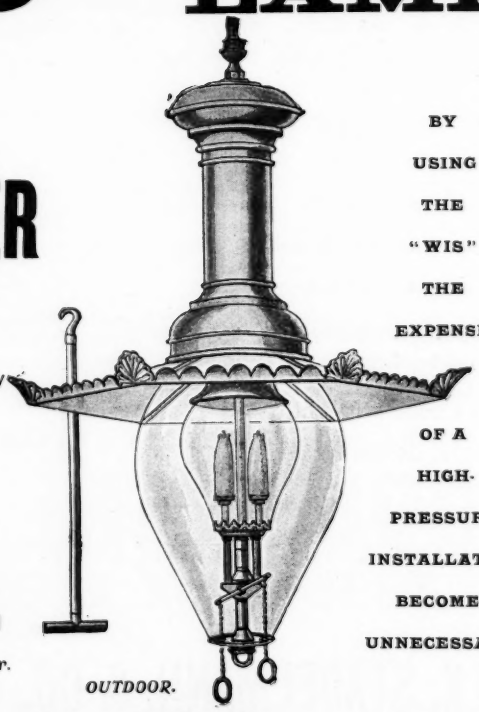
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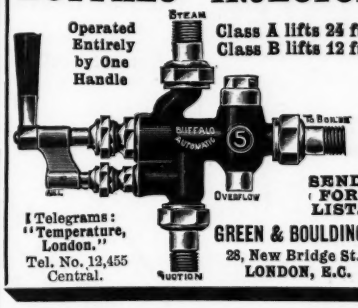

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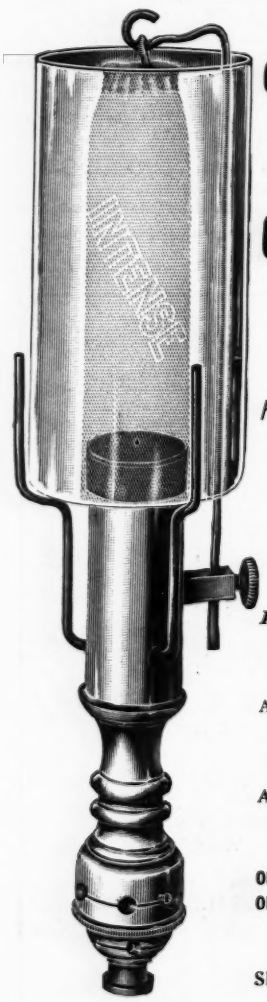

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BEST ARE ENGLISH MADE.
SUPERBLY FINISHED.
OF HIGHEST LIGHTING EFFICIENCY.
ACCURATELY REGULATED.
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Cliff's Patent Machine-Made Retorts possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

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Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

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5 in. long.
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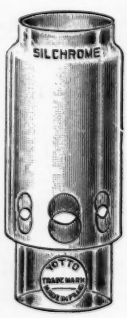

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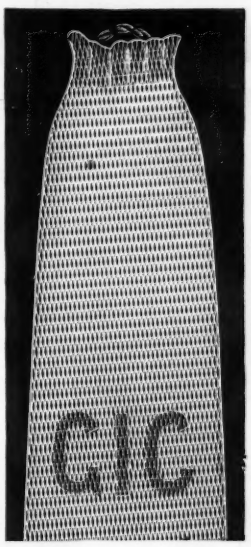

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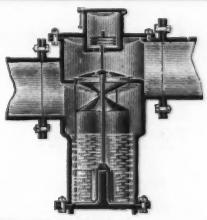

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SPECIALS FOR WATER GAS PLANTS.

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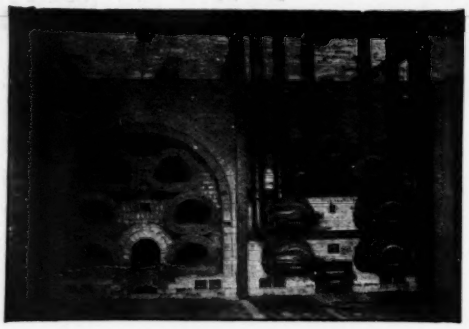

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Benzol, Toluol, Solvent Naphtha, Creosote Oils, Grease Oils, Carbolic Acid, Crude Creosote Salts, Granulated (Crude) Naphthalene, Sublimed Naphthalene, Anthracene, Refined Tar, Pitch, also Sulphate of Ammonia.

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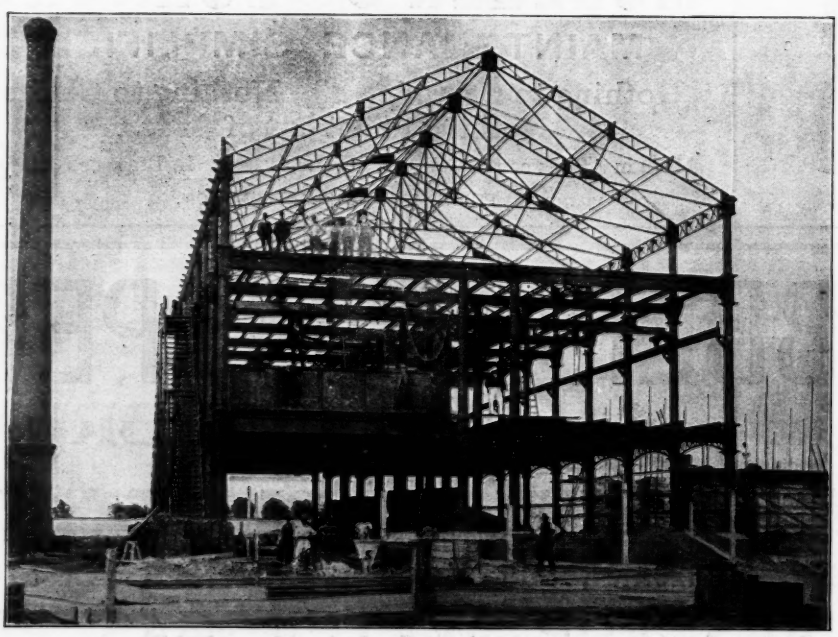

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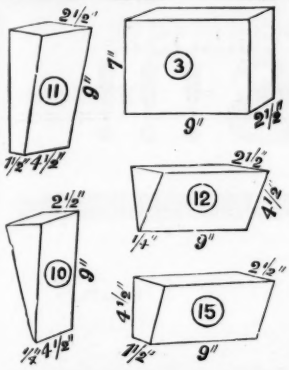
Contractors to a large number of the Principal Gas-Works.



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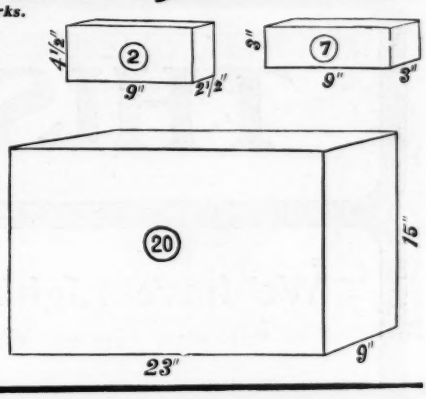
Without doubt the finest Materials in the Market for Gas-Works Furnaces.

BRICKS, BLOCKS, TILES, & SHIELDS of any shape made to order.



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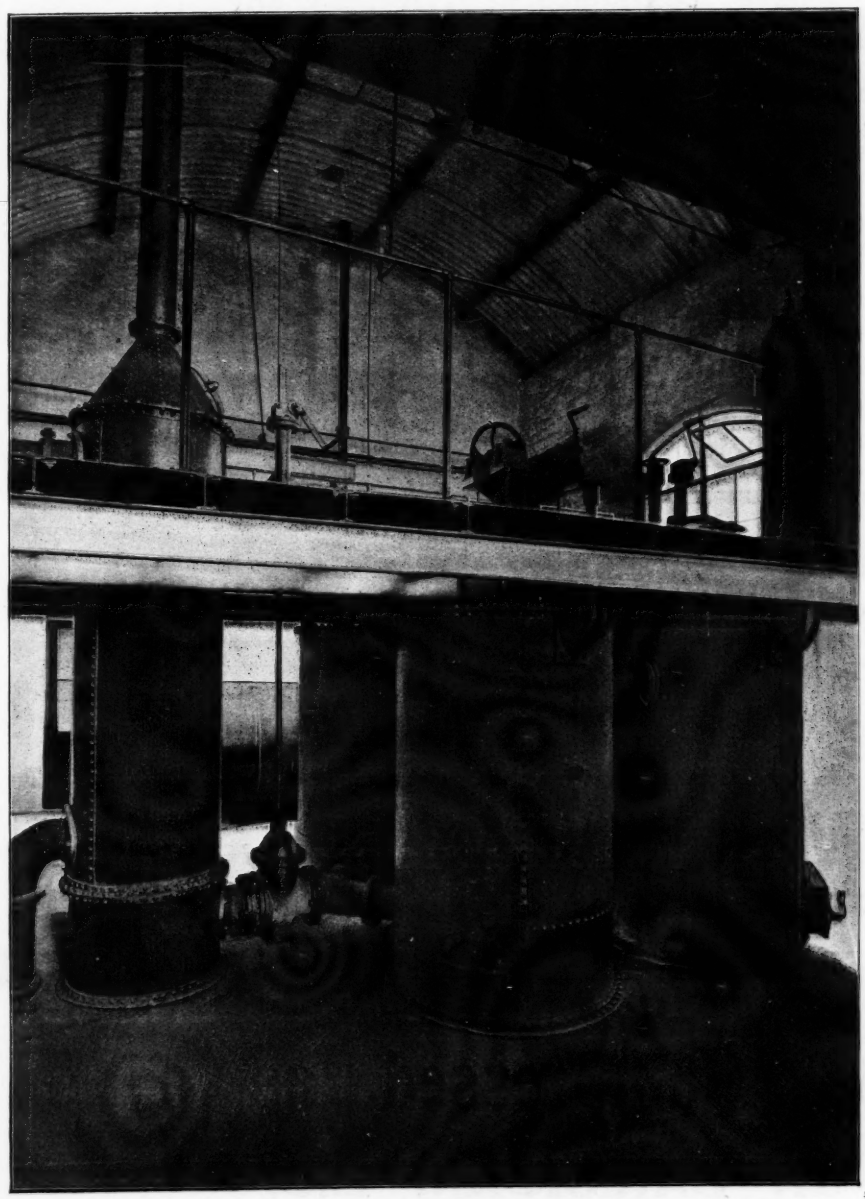
(DR. KRAMERS & AARTS PATENTS).



The Kramers and Aarts Blue Water Gas Plant at the Zevenbergen Gas-Works.

Guaranteed Results per 1000 Cubic Feet of Gas.

Calorific Power, 315 B.T.U. per cubic foot.

Use of Carbon in the Generators, 22 lbs.

Use of Steam in the Generators, 3·3 Gallons.

Percentage Composition:

CO_2 3·5

O_2 0·2

CO 45·0

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Difference 3·3

Plants erected since 1902, or in erection, at the following Gas-Works—

	Cubic Feet Daily.
Amsterdam - -	2,118,000
Zevenbergen - -	125,000
Breda (Test Station)	425,000
Cadiz - - -	125,000
Venlo - - -	175,000

Offices: P.C. HOOFTSTRAAT 62, AMSTERDAM.

THIS TALKS!!!

We have Lighted a Section of Plymouth Docks
for the Great Western Railway Company.

An Extension has been Ordered. .

We have completed at Aylesbury an Installation—Town Hall, Market, &c. .

The Council has unanimously decided that we be requested to do the whole of the Public Lighting.

We are

50 per cent. Cheaper than Incandescent Gas.
70 ,, Electric Arc.
80 ,, ,, Incandescent.
120 ,, Ordinary Fishtail.

BERLIN, the Finest Lighted City in the World, **has adopted Millennium**

It is the **LAST WORD.**

THE MILLENNIUM SYSTEM IS A METHOD OF COMPRESSING ORDINARY GAS. . . . .

If you want to get **MORE LIGHT** and **CUT THE COST**, write—

The British Compressed Gas Co., Ld.,

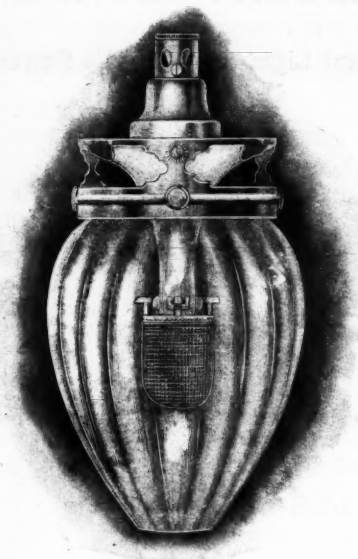
57, BARBICAN, E.C.

THE ORIGINAL NEW INVERTED INCANDESCENT GAS-BURNERS

BRITISH MANUFACTURE.

INCREASED DISCOUNTS TO THE TRADE.

New types of BURNERS at popular Prices for the coming Season.



MAXIMUM LIGHT WITH MINIMUM CONSUMPTION OF GAS.

The "Bijou" Burner in clusters for interior lighting has the decorative effect of Electric light at One-Eighth the cost.

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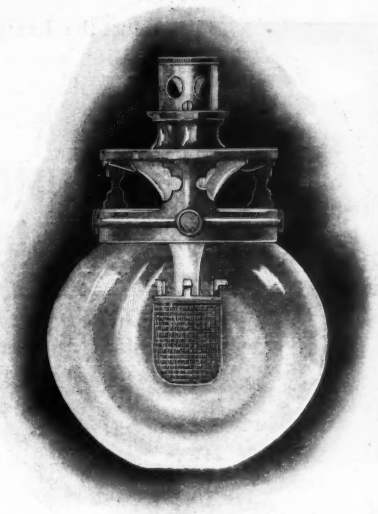

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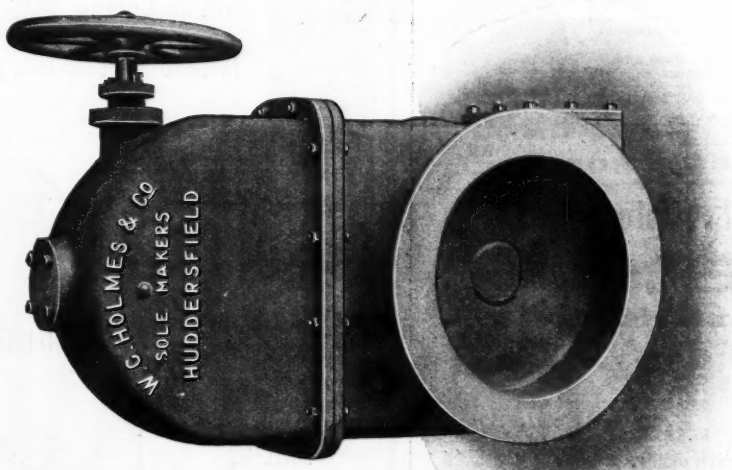

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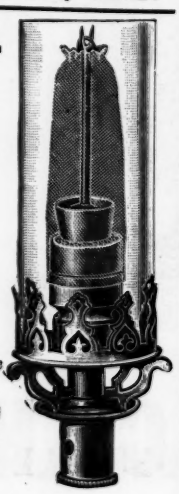

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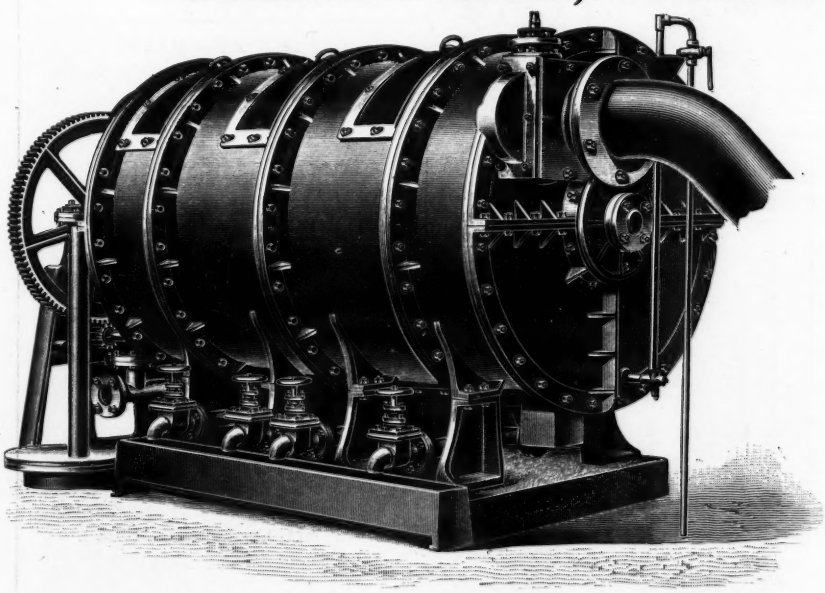

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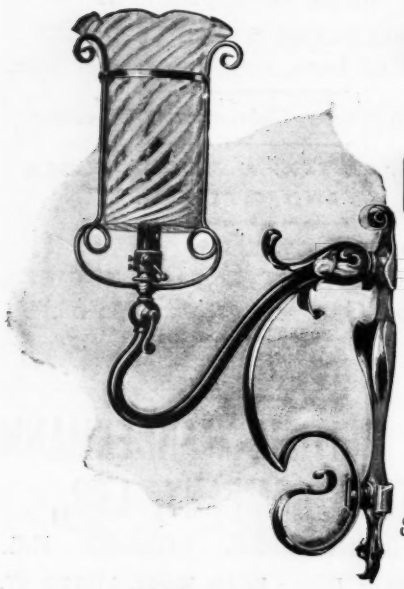

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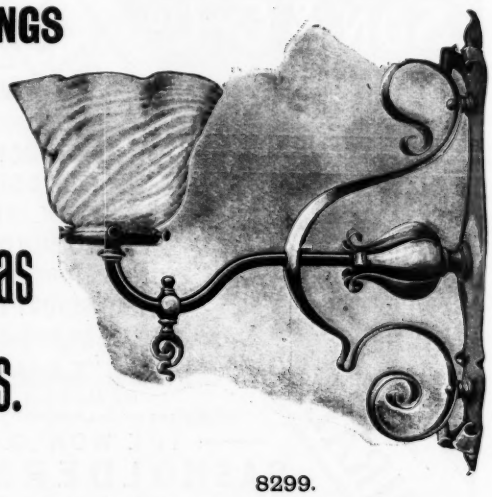

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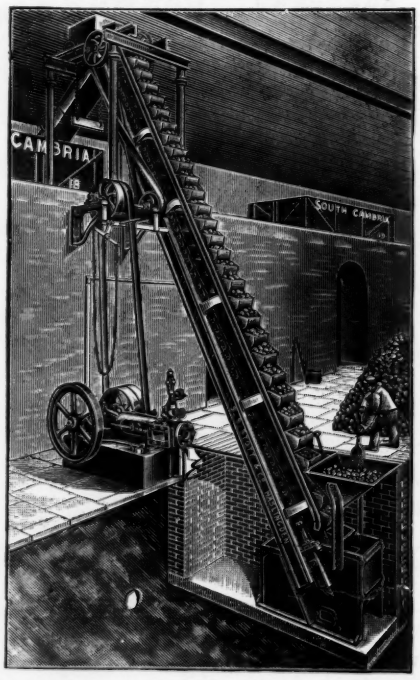

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